TANDBERG
Television

ST.TM.E9140.9
Issue 9
ENGLISH (UK)

INSTRUCTION MANUAL

E5210, E5410, E5610 Encoder

Software Version 1.8 (and later)

(Host Processor of Motherboard)

M2/ENC/E5210, M2/ENC/E5410, M2/ENC/E5610, M2/ENC/E5610/48V and Options

ENGLISH (UK)

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If you do not understand the contents of this manual
DO NOT OPERATE THIS EQUIPMENT**.**

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Se non si capisce il contenuto del presente manuale
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Αν δεν καταλάβετε το περιεχόμενο αυτού του βοηθήματος/εγχειριδίου
ΜΗΝ ΛΕΙΤΟΥΡΓΗΣΕΤΕ ΑΥΤΟΝ ΤΟΝ ΕΞΟΠΛΙΣΜΟ.

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Si no entiende el contenido de este manual
NO OPERE ESTE EQUIPO.

Podemos asimismo suministrarle una traducción de este manual al (idioma) previo pago de una cantidad adicional que deberá abonar usted mismo.

Issue 9 first published in 2002 by:
TANDBERG TELEVISION LTD

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UNITED KINGDOM

Registered Company Number 03695535

List of Contents

About this Manual

This manual provides instructions and information for the installation and operation of the Encoder.

This manual should be kept in a safe place for reference for the life of the equipment. It is not intended that this manual will be amended by the issue of individual pages. Any revision will be by a complete reissue. Further copies of this manual can be ordered from the address shown on *page vii*. If passing the equipment to a third party, also pass on the relevant documentation.

Issues of this manual are listed below:

Issue	Date	Software Version	Comments
1	June 1998	Build Standard 01-01-01-01-01	Initial release.
2	Nov 1998	1.8 (and later)	Addition of and changes to the menus.
3	Mar 1999	1.8 (and later)	Revised to cover –48Vdc model (M2/ENC/5610/48V). Minor amendments.
4	Nov 1999	1.8 to 2.5	Software update. Changes to the menus. Addition of Chapter 6, Digital Electronic News Gathering.
5	Jan 2000	1.8 to 2.8	Minor changes to the audio and mux menus. Addition of ATM option module.
6	Oct 2000	Encoder = 1.8 to 3.1 Digital ENG = 2.5	Software update to 3.1. Software version is that of the Host Processor. Addition of PAL Plus. Minor changes to ATM menus and Video menus. Addition of S10986/S10904 Compact Remux Option Module MK2 and S11146 ASI_SMPTE_310_Output_Module.
7	Mar 2001	1.8 to 3.5 (part)	Software update to 3.4. Rearrangement of manual structure. Removal of DENG information. Chapter 3 created for Upgrades and Options Information. New functionality added: BISS; PSIP insertion via remux; Reflex over the internet; new linear audio transport stream format. Chapter 4 completely revised. Inverted Teletext option added. (However, Server Functionality and 15 dB Audio options not included at this manual issue.)
8	July 2001	1.8 to 3.5	PAL Plus removed. Server Functionality included. Contact details amended. Minor editorial changes throughout. Error messages and alarm/fail masking details added to Chapter 6. Annex C information moved to Chapter 6. Encoder Mode relay information added. PSIP availability with E5610 only restriction removed.
9	March 2002	1.8 – 3.6	Registered and contact addresses revised. Latest 48 Vdc connector illustrated. New menus options added. General review of contents.

The following manual is also associated with this equipment:

- ST.TS.E9140: Remote Control Protocol

Acknowledgements

General

All best endeavours have been made to acknowledge registered trademarks and trademarks used throughout this manual. Any notified omissions will be rectified in the next issue of this manual. Some trademarks may be registered in some countries but not in others.

Registered trademarks and trademarks used are acknowledged below and marked with their respective symbols. However, they are not marked within the text of this manual.

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Warnings, Cautions and Notes

Heed Warnings

All warnings on the product and in the operating instructions should be adhered to. The manufacturer can not be held responsible for injuries or damage where warnings and cautions have been ignored or taken lightly.

Read Instructions

All the safety and operating instructions should be read before this product is operated.

Follow Instructions

All operating and use instructions should be followed.

Retain Instructions

The safety and operating instructions should be retained for future reference.

WARNINGS...

WARNINGS GIVE INFORMATION WHICH, IF STRICTLY OBSERVED, WILL PREVENT PERSONAL INJURY OR DEATH, OR DAMAGE TO PERSONAL PROPERTY OR THE ENVIRONMENT. THEY ARE BOXED AND SHADED FOR EMPHASIS, AS IN THIS EXAMPLE, AND ARE PLACED IMMEDIATELY PRECEDING THE POINT AT WHICH THE READER REQUIRES THEM.

CAUTIONS...

Cautions give information which, if strictly followed, will prevent damage to equipment or other goods. They are boxed for emphasis, as in this example, and are placed immediately preceding the point at which the reader requires them.

NOTES...

Notes provide supplementary information. They are highlighted for emphasis, as in this example, and are placed immediately after the relevant text.

EMC Compliance

This equipment is certified to the EMC requirements detailed in *Annex B, Technical Specification*. To maintain this certification, only use the leads supplied or if in doubt contact Customer Services.

Contact Information

TANDBERG Television Customer Services

Support Services

Our primary objective is to provide first class customer care that is tailored to your specific business and operational requirements. All levels are supported by one or more service performance reviews to ensure the perfect partnership between TANDBERG Television and your business.

Levels of Support

We offer a number of support service levels so you can choose the one most appropriate to your business requirements.

- For the initial 12 months, Bronze Level Support is provided free on this product. An extended time period can be purchased for this level.
- Silver Level Support extends the coverage to include on-site support, preventive maintenance and discount on predesigned training.
- The Gold Level Support gives an enhanced support package. It builds on the Silver Level by including advanced repair exchange, an account focused engineer, version migration support and further discount on predesigned training.

Where to Find Us

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Australia/NZ:	+61 2 9356 8599 fieldservice-australia@tandbergtv.com
Germany:	+49 8996 999 870
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Internet Address:	http://www.tandbergtv.com

Technical Training

Training Courses

TANDBERG Television provides a wide range of training courses on the operation and maintenance of our products and on their supporting technologies. TANDBERG can provide both regularly scheduled courses and training tailored to individual needs. Courses can be run either at your premises or at one of our dedicated training facilities.

Where to Find Us

For further information on TANDBERG Television's training programme please contact us:

International Telephone:	+44 23 8048 4229
International Facsimile	+44 23 8048 4467
E-mail Address:	training@tandbergtv.com
Internet Address	http://www.tandbergtv.com

Customer Services and Technical Training Postal Address

Tandberg Television
Unit 2
Strategic Park
Comines Way
Hedge End
Southampton
Hampshire
SO30 4DA
United Kingdom

Return of Equipment

If you need to return equipment for repair, please contact the Customer Services Helpdesk on +44 (0) 23 8048 4455. A Returns Authorisation Number (RAN) will be issued and full details of the unit will be logged. Please ensure the RAN number is clearly marked on the packaging of the unit. The unit should then be sent to the following address:

Tandberg Television – Customer Services
Unit 1
Strategic Park
Comines Way
Hedge End
Southampton
Hampshire
SO30 4DA
United Kingdom

Technical Publications

If you need to contact TANDBERG Television Technical Publications regarding this publication, e-mail: techpubs@tandbergtv.com.

Chapter 1

Introduction to the Basic Encoder

Contents

List of Figures

List of Tables

1.1 Scope of this Manual

1.1.1 Who Should Use this Manual

This manual is written for operators/users of the E5210, E5410 and E5610[/48V] Encoders to assist in the installation, operation and day-to-day care. The E5x10 Encoders are referred to throughout this manual as **Encoder**(**s**).

The Encoder may be used as a stand-alone unit where it is controlled from the front panel or it may be integrated into a larger system (possibly multichannel) where it can be controlled externally via a control and monitoring software package.

The manual is written to assist in the installation, operation and day-to-day care of the unit. All information is applicable to all models of the Encoder unless otherwise stated.

WARNING...

DO NOT REMOVE THE COVERS OF THIS EQUIPMENT. HAZARDOUS VOLTAGES ARE PRESENT WITHIN THIS EQUIPMENT AND MAY BE EXPOSED IF THE COVERS ARE REMOVED. ONLY TANDBERG TELEVISION TRAINED AND APPROVED SERVICE ENGINEERS ARE PERMITTED TO SERVICE THIS EQUIPMENT.

CAUTION...

Unauthorised maintenance or the use of non-approved replacements may affect the equipment specification and invalidate any warranties.

This manual does not include any maintenance information or procedures which would require the removal of covers.

1.1.2 Firmware/Software Versions

This manual has been written to cover the functionality of firmware version **1.1 and later** of the Motherboard (S8442) and software version **1.8 and later** of the Host Processor of the Motherboard. The current software version can be found by viewing the Version Info Menu (see *Chapter 4, Operating the Equipment Locally, Figure 4.17*).

This manual continues to be relevant to subsequent firmware issues where the functionality of the equipment has not changed. Where a new issue of firmware changes the functionality, a new issue of this manual is provided.

1.1.3 What Equipment is Covered by this Manual

Equipment Models

Figure 1.1: Typical Encoder Front View

Each model of Encoder comprises an enclosure with various boards/modules fitted. There are vacant slots for up to four[1] option modules, depending upon the Encoder model. These slots can be occupied by any of the combinations of modules shown in *Chapter 3, Options and Upgrades*.

No options need be fitted but any slot not occupied by an option module must have a blank module or blanking plate fitted (see *Chapter 3, Options and Upgrades*).

The marketing numbers and model numbers of the basic units are shown in *Table 1.1*, those of the option modules in *Chapter 3, Options and Upgrades.*

Table 1.1: Equipment Model Descriptions

Model Name	Model Number	Marketing Number	Description
E9140	Encoder E5210	M2/ENC/E5210	MPEG-2 Encoder with 4:2:0 video encoding mode and hierarchical motion estimation.
E9141	Encoder E5410	M2/ENC/E5410	MPEG-2 Encoder with 4:2:0/4:2:2 video encoding modes, hierarchical motion estimation and enhanced software capability.
E9142	Encoder E5610	M2/ENC/E5610	MPEG-2 Encoder with 4:2:0/4:2:2 video encoding modes, fully exhaustive motion estimation and enhanced software capability.
E10006	Encoder E5610 (-48 Vdc)	M2/ENC/E5610/48V	MPEG-2 Encoder with 4:2:0/4:2:2 video encoding modes, fully exhaustive motion estimation and enhanced software capability. Version for operation from –48Vdc power supply.

Information Label

There are two information labels which identify the configuration of the unit. *Figure 1.2* and *Figure 1.3* are typical examples (see *Figure 1.8* for their positioning on the Encoder).

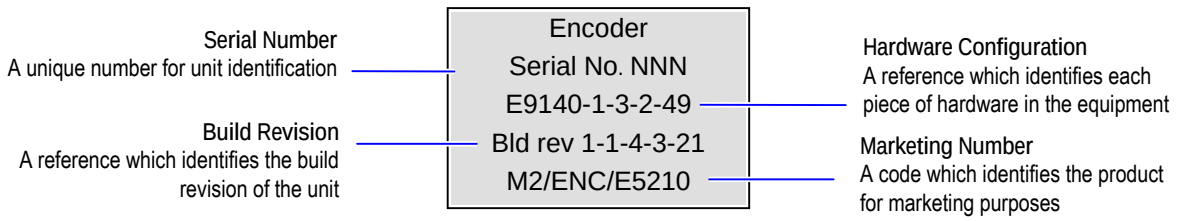

Figure 1.2: Typical Information Label 1

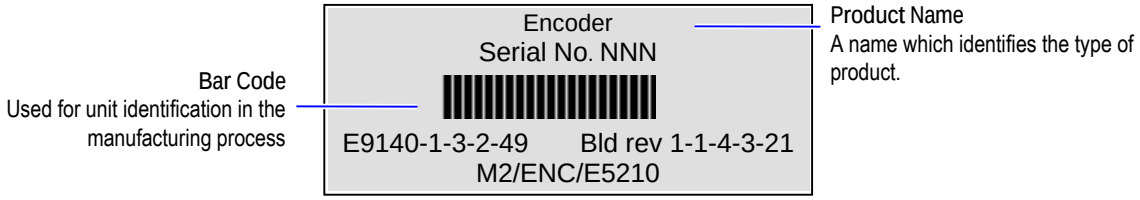

Figure 1.3: Typical Information Label 2

[1] Model E5610[/48V] only has three option module slots.

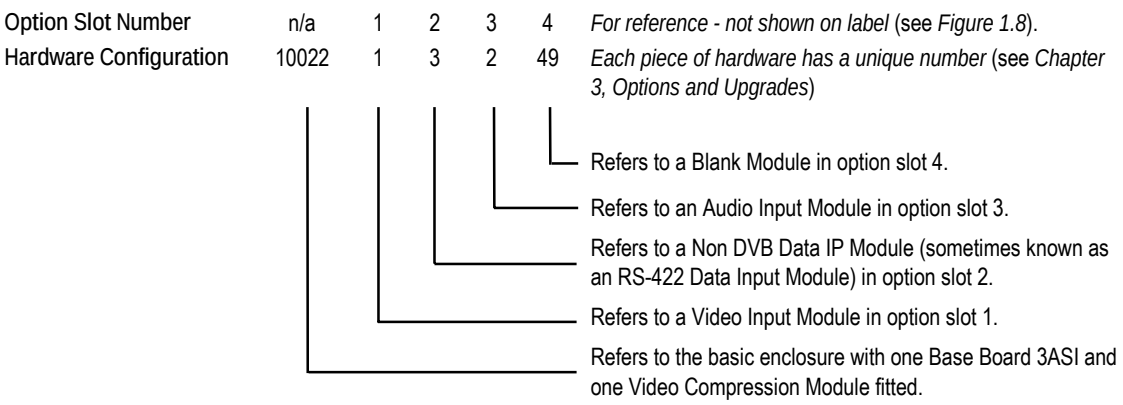

Figure 1.4: Correlation Between Hardware and Option Slots

> NOTE...
> Refer to *Figure 1.8* for the position of the option module slots.

Hardware Configuration

Each piece of hardware has a specific reference number. These are linked to give a hardware configuration number (see *Figure 1.4*) for the whole unit. The first part of the number refers to the enclosure and any modules forming part of the basic unit, and each subsequent part of the number refers to an option module. Refer to *Chapter 3, Options and Upgrades* for the possible positions of each option module.

Build Revision

The build revision (see *Figure 1.4*) refers to the physical status of the enclosure and any option modules at the time the equipment was shipped from the factory.

Firmware / Software Versions

This manual has been written to cover the functionality of the firmware versions which are contained within the build revision identified on the information label (see the rear of the Encoder and also *Figure 1.4*).

This manual continues to be relevant to subsequent build standards where the functionality of the equipment has not changed. Where the build standard changes the functionality, a new issue of this manual is provided.

1.2 Role of the Encoder in a System

1.2.1 Typical System

The Encoder is a rack mounted MPEG-2 video Encoder optimised for multichannel systems, and also for Single Programme Transport Stream (SPTS) equipment. It is fully MPEG-2 and DVB compliant. The unit contains a single video encoder, two stereo audio encoders (dual standard MPEG-1 (layer 2)/Dolby Digital) and general purpose VBI extraction and encoding circuitry.

High quality video encoding is ensured by the inclusion of digital noise reduction techniques and many other proprietary algorithms as well as standard MPEG compression techniques. Hierarchical or Fully Exhaustive motion estimation is also used.

Video is input to the unit in either serial (SDI) or parallel digital 656 D1 format. The range of video input formats can be extended to include analogue by fitting the Additional Video Input Option (see *Chapter 3, Options and Upgrades*). There is also a logo overlay facility allowing broadcasters to trademark material.

The audio functionality supports multiple sampling frequencies, bit-rates and coding modes. Audio can be input in balanced analogue, digital AES/EBU input as a discrete channel or embedded on serial digital video. Additional audio channels can be accommodated by using the appropriate option (*see Chapter 3, Options and Upgrades).*

Control of the unit is via an Ethernet connection to the System 3000 Multiplex Control Computer (MCC) or via local control using the front panel keyboard. Local health monitoring is incorporated, as is automatic redundancy switching and a local alarm/fail/reset port.

The output of the unit is a multiplexed transport stream on the DVB ASI format. Three ASI outputs are provided to ensure that redundancy of multiplexing equipment can be supported, with a spare output for monitoring purposes.

Unit functionality can be further extended with option modules (see *Chapter 3, Options and Upgrades*).

1.2.2 Single Programme Transport Stream

When the SPTS mode is used, the multiplexed video, audio and data output signal is format as an SPTS MPEG-2 transport stream for direct connection to a Modulator (see *Figure 1.5*). Several TANDBERG Television proprietary and DVB-PI interface types are provided, see *Section 1.3*, *Summary of Features*. A direct connection is provided for a control computer.

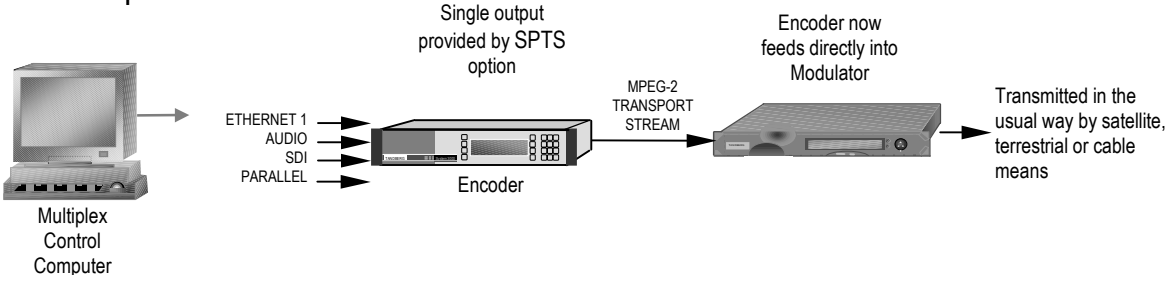

Figure 1.5: Typical Single Programme Transport Stream Configuration

For further information on the System 3000 range of products, refer to the appropriate manual or contact Customer Services (see *Preliminary Pages*).

1.2.3 Multiple Channels Per Carrier

If the Multiple Channels Per Carrier (MCPC) mode is used, the multiplexed video, audio and data signals are output in an MCPC MPEG-2 transport stream format for direct connection to a Multiplexer (see *Figure 1.6*). Several TANDBERG Television proprietary and DVB-PI interface types are provided, see *Section 1.3, Summary of Features*. A direct connection is provided for a control computer.

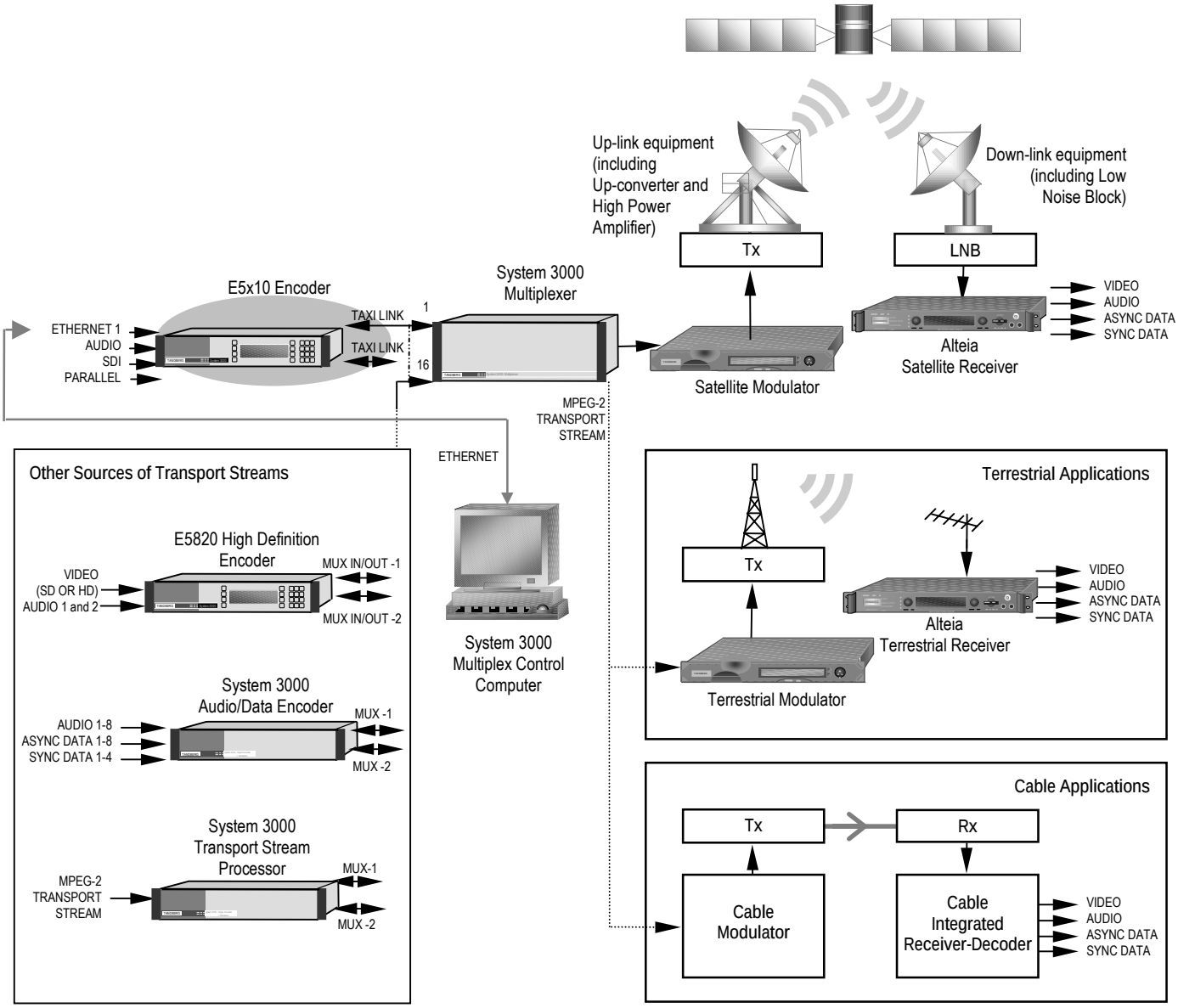

Figure 1.6: Typical System 3000 Configuration (Multiplexer Interface Option)

1.3 Summary of Features

1.3.1 Video Encoding

MPEG-2 Encoding

The Encoder processes a broadcast-standard video signal into a compressed encoded bit-stream in accordance with:

- The MPEG-2 Main profile @ Main level (MP@ML) specification (ISO/IEC 13818).
- The MPEG-2 4:2:2[2] profile @ Main Level (422P@ML) specification.

Video Encoding Modes

Either the 4:2:0 or 4:2:2[2] video encoding modes can be selected. The coding mode selected affects the compression techniques, Encoder delay and rate control.

Video Inputs

The standard video inputs are:

- **SDI** - Serial Digital Input - ITU-R BT.656-4 (D1 serial format) – SMPTE 259
- **Parallel** - Parallel 656 Digital Video - SMPTE-125M

Video Server Functionality (V3.5 on)

- Contact Customer Services for details.

Video Input Types

The video input types which are supported are:

- When M2/EOM/VID analogue option module is fitted
  - ✧ 625-line composite PAL-B, -D, -G, -H or I (ITU-R BT. 624-4)
  - ✧ 525-line composite NTSC-M or PAL-M (ITU-R BT. 624-4)
- Serial digital (ITU-R BT. 656-4 part 3) input (D1 serial format)
- Parallel digital 4:2:2[2] Y, C_R, C_B (ITU-R BT. 656-1) 525/625 user-selectable
- Internal test pattern function

Serial Digital Video Input Error Detection and Handling (EDH)

The serial digital video input supports error detection and handling (EDH) as defined by the specification SMPTE RP 165-1994, 'Error Detection Checkwords and Status Flags for Use in Bit Serial Digital Interfaces for Television'. Refer to *Chapter 5*, *Equipment Description* for further information.

[2] 4:2:2 mode is not supported by model E5210.

Video Encoding Functions

The standard video encoding functions include:

- Support for all MP@ML standard coding modes
- Selectable bit-rate operation, 0.5 Mbit/s - 50 Mbit/s (depending upon Encoder model, see *Table 1.2*)
- Support for the standard set of video picture resolutions (720, 704, 640, 544, 480, 352 and SIF) in both 625 and 525 line operation
- Hierarchical[3]/fully exhaustive[4] motion estimation
- A built-in frame resynchroniser to maintain a valid encoded bit-stream in the event of loss of video
- Support for Active Format Descriptor (AFD)
- Support for a variety of Group of Pictures (GOP) structures with a variable number of B frames
- Built-in patented adaptive noise reduction circuitry
- The ability to generate internal video test patterns. These can be moving.
- A logo overlay facility whereby the Encoder is able to overlay broadcasters' trademarks/logos onto the active video

Motion Estimation

Encoder models E5210 and E5410 use **hierarchical** motion estimation. This process takes a macro block (16 pixels x 16 pixels) and then performs a series of exhaustive searches for that block on areas of increasing resolution homing in on an exact match.

Encoder model E5610[/48V] uses **fully exhaustive** motion estimation. This takes the same macro block of 16 pixels x 16 pixels as the hierarchical system, but it performs a single exhaustive search at the full resolution.

Video Variable Bit-rate

The MPEG-2 compression algorithm uses adaptive field/frame coding, forward and backward predictive processing with motion estimation and compensation to reduce the bit-rate to the range shown in *Table 1.2*.

Table 1.2: Video Bit-rate Range[5]

Model Number	Video Encoding Mode	
	4:2:0	4:2:2[6]
E5210	1.5 Mbit/s - 15 Mbit/s	—
E5410	1.5 Mbit/s - 15 Mbit/s	2 Mbit/s - 45 Mbit/s
E5610[/48V]	0.5 Mbit/s - 15 Mbit/s	1.5 Mbit/s - 50 Mbit/s

[3] Hierarchical motion estimation is only supported by Models E5210 and E5410.
[4] Fully exhaustive motion estimation is only supported by model E5610[/48V].
[5] The video bit-rate depends on the Multiplexer bit-rate which is set.
[6] 4:2:2 coding mode is not supported on model E5210.

Coding Resolutions

To provide optimum picture quality over the full range of supported bit-rates, the encoded picture resolution is controlled automatically according to the video bit-rate. Alternatively, the user can override this and select manual control, if desired. Coding resolutions are shown in *Table 1.3*. System configuration can be stored in non-volatile random access memory (NVRAM) for restoration of configured state at power-on.

Table 1.3: Video Coding Resolutions and Typical Bit-rates

625 Line Modes	525 Line Modes	Typical Bit-rate 4:2:0 (Mbit/s)	Typical Bit-rate 4:2:2[7] (Mbit/s)
720 pixels x 576 lines	720 pixels x 480 lines	4.0-8.0	up to 50
704 pixels x 576 lines	704 pixels x 480 lines	4.0-8.0	up to 50
544 pixels x 576 lines	544 pixels x 480 lines	2.5-6.0	-
480 pixels x 576 lines	480 pixels x 480 lines	2.0-6.0	-
352 pixels x 576 lines	352 pixels x 480 lines	1.5-4.0	-
544 pixels x 288 lines	544 pixels x 240 lines	1.5-3.0	-
480 pixels x 288 lines	480 pixels x 240 lines	1.5-3.0	-
352 pixels x 288 lines	352 pixels x 240 lines	1.0-2.5	-

Internal Frame Synchroniser

An internal frame synchroniser is incorporated to maintain a valid encoded bit-stream in the event of discrepancies between the relative timing of the input video syncs and the internal flywheel syncs.

Output on Video Loss

The Encoder can be software-configured to show, in the event of video input loss, either:

- Test pattern
- Freeze frame
- Cut to a black screen

1.3.2 Audio Encoding

General

Audio can be encoded to either:

- MPEG-1 Audio (layer 2) standard (sampling rate 32 kHz or 48 kHz)
- Dolby Digital (sampling rate 32 kHz, 44.1 kHz or 48 kHz)

Output bit-rate is selectable in the range 32-384 kbit/s (dependent on configuration) for MPEG-1 Audio (layer 2) and 56-640 kbit/s (dependent on configuration) for Dolby Digital.

- Pre-compressed (or pre-encoded – IEC 61937) audio in pass-through mode is also available (it only operates at 48 kHz). This is where an audio stream has already been encoded externally, prior to entering the Encoder, and passes through to the output. This type of audio is supported in Dolby Digital.

[7] 4:2:2 coding mode is not supported on model E5210.

The input for this type of audio is either via the Serial Digital Input of the audio connector or it can be embedded with the incoming video.

Audio Inputs

The standard audio input is:

- **AUDIO IN** - 15 way male D-type - software selectable balanced analogue or digital AES/EBU, with AES/EBU on left only. The right channel can be configured to output a reference AES/EBU signal for an external Dolby AC-3 Encoder. The audio connector is a 15-way male D-type, but a break out cable is supplied which plugs into this connector and provides a more convenient means of connecting the audio inputs via four XLR female connectors.
- Alternatively, audio can be input embedded as AES/EBU on the serial digital input (SDI). In this mode a maximum of four stereo pairs can be extracted. Audio may be converted to either of the standard output frequencies, 32 kHz or 48 kHz, by use of the built-in asynchronous sample rate converters.

Audio Channels

The Encoder supports four channels of audio, which may be configured as:

- Four analogue single mono channels, 600 Ω or 20 kΩ
- Two analogue stereo pairs, 600 Ω or 20 kΩ
- Two digital channels, AES/EBU or embedded SDI (option)

MPEG Encoding Modes

The two stereo pairs may be configured in various encoding modes:

- **Single mono:** the left channel is encoded - the signal is output to both XLR connectors at the receiving end.
- **Dual mono:** the left and right signals are encoded and carried in the transport stream as a single Packetised Elementary Stream (PES) data stream. The way that the left and right signals are output from the Receiver is dependent on how the routing is set up on the Receiver. Both the left and the right may be output, or the left only, or the right only. This is typically used for multilingual services.
- **Stereo:** A stereo pair is coded as two mono signals - the two signals are output as stereo at the receiving end.
- **Joint/intensity stereo:** A stereo pair is coded taking advantage of the stereo nature of the channels - the two signals are output as stereo at the receiving end.

> NOTE...
> Joint/intensity stereo is not available in Dolby Digital mode.

Test Tones

The equipment can be configured to generate a test tone for alignment purposes. Refer to *Annex B, Technical Specification* for level and frequency.

Audio Variable Bit-rate

MPEG-1 audio output bit-rate (see *Table 1.4*) is selectable in the range 32-384 kbit/s (dependent on configuration).

Table 1.4: MPEG-1 Audio Encoding Bit-rates

Bit-rate (kbit/s)	Single Channel Mono	Dual Channel Mono	Dual Channel Stereo	Dual Channel Joint (Intensity) Stereo
32	✓	-	-	-
48	✓	-	-	-
56	✓	-	-	-
64	✓	✓	✓	✓
80	✓	-	-	-
96	✓	✓	✓	✓
112	✓	✓	✓	✓
128	✓	✓	✓	✓
160	✓	✓	✓	✓
192	✓	✓	✓	✓
224	-	✓	✓	✓
256	-	✓	✓	✓
320	-	✓	✓	✓
384	-	✓	✓	✓

Dolby Digital

Dolby Digital audio encoding incorporates digital normalisation, preprocessing (filtering), dynamic range compression and the addition of bit-stream information. Dolby Pro Logic audio can be carried as stereo audio through the Encoder as long as a suitably high bit-rate is selected.

Table 1.5: Dolby Digital Audio Encoding Bit-rates

Bit-rate (kbit/s)	Single Channel Mono (1/0)	Dual Channel Stereo (2/0)
56	✓	-
64	✓	-
80	✓	-
96	✓	✓
112	✓	✓
128	✓	✓
160	✓	✓
192	✓	✓
224	✓	✓
256	✓	✓
320	✓	✓
384	✓	✓
448	✓	✓

Bit-rate (kbit/s)	Single Channel Mono (1/0)	Dual Channel Stereo (2/0)
512	✓	✓
576	✓	✓
640	✓	✓

1.3.3 Transport Stream Outputs

Standard Data Output Connectors

The standard data output connectors are:

- DVB ASI OUT (for evolution *5000* and third-party equipment)
- MUX IN/OUT 1 (TAXI format)
MUX IN/OUT 2 (TAXI format) } For connection to System 3000 Multiplexer

Output Modes

Compressed data is output from the Encoder in two software-selectable modes:

- Transport stream - a premultiplexed stream of audio, video and data with null packet insertion and basic Service Information (SI). This is from the ASI connector.
- Proprietary - a partial transport stream proprietary format for connecting to existing System 3000 TANDBERG Television multiplexing equipment. This is from the MUX IN/OUT 1 and 2 TAXI connectors.

1.3.4 Vertical Blanking Interval Line Processing

Introduction

The Encoder has three modes for processing VBI lines.

VBI in Picture

By selecting the extended active picture format available in the MPEG 4:2:2[8] specification the Encoder compresses and transmits the VBI data as part of the active picture. This mode requires up to 3 Mbit/s of extra bit-rate, depending on the amount and complexity of the VBI present.

> NOTE...
>
> VBI in Picture transmits the VBI waveform as part of the picture and as such will be subject to some distortion. Most analogue VBI types are robust against this type of distortion but others, e.g. video index, are intended for SDI transmission and will not survive MPEG coding/decoding in VBI in Picture mode.

[8] 4:2:2 mode is not supported by Model E5210.

VBI in PID

The Encoder has the ability to extract and transmit a wide variety of VBI line formats. Field Programmable Gate Array (FPGA) circuitry on the front end of the equipment incorporates a number of general purpose line grabbers so that known formats of VBI data can be extracted. Closed caption data together with other formats of VBI data such as VITC and VPS are to be transmitted in the user data field of the video.

The following VBI data formats are supported:

- Line 21 data Services EIA-608 (Closed Caption and V-chip)
- Neilson AMOL I and AMOL II
- Vertical Interval Time Code, VITC (EBU and SMPTE)
- Programme Delivery Control PDC, via ITU-R system B Teletext extension data packets of type 8/30, format 2 and Line 16 Video Programming System (VPS). Video Programming Teletext (VPT) and VPS are trade names
- Wide Screen Signalling (WSS, ETS 300 294)
- Video Index (for Pan Scan, Aspect Ratio and Active Format Descriptor)

Teletext Extraction

The Encoder supports internal Teletext data extraction (Teletext drop) from the VBI of a video input and formats this data into a transport packet, as specified in the DVB specification.

The Encoder can extract up to 18 lines of Teletext from each field of the video frame. The supported VBI line number range is 10-22 and 273-285 for 525 lines and 7-24 and 319-336 for 625 lines. Line filters can be invoked to selectively disable any individual lines in this range. These are provided to allow the user to ensure that non-Teletext lines (e.g. ITS lines) are not erroneously extracted. The extracted Teletext lines are formatted into PES packets according to the DVB specification. The Teletext PES packets are time-stamped to allow correct alignment of subtitling captions with decoded video.

The following Teletext services are extractable:

- System B (WST) Teletext
- Inverted Teletext (from V 3.5)
- PDC Programme Delivery Control

1.3.5 Control and Monitoring

Remote control of the Encoder is via the Ethernet network running the Simple Network Management Protocol (SNMP) protocol. There are several control devices: either a Multiplex Control Computer (MCC), TANDBERG Director, STREAMS[9] or Reflex[10] for multichannel systems. The protocol is the same. Alternatively, Local control is implemented through the front panel keypad and display.

1.3.6 Options and Upgrades

Options and Upgrades are described in *Chapter 3, Options and Upgrades*.

[9] STREAMS does not support Encoder model E5210.
[10] Reflex is not supported by models E5210 and E5410.

1.4 Guided Tour

1.4.1 The User Interface

The Encoder itself provides no controls at the rear panel but there is a status display and keypad at the front panel. All connectors are provided at the rear panel. Control and monitoring may be performed in a variety of ways (see *Section 1.3.5, Control and Monitoring*). Once configured, the system runs without the need for further intervention unless system configuration requirements change.

1.4.2 LED Colour Coding Philosophy

Two LED colours are used externally in this equipment:

- **Red** is used to indicate fault conditions, e.g. a missing or faulty input signal. For correct operation, the red LED must be off, although it may be on briefly during power-up.
- **Green** is used to indicate correct conditions and correct system functioning. For normal operation, the green LED must be on continuously.

This colour coding principle was devised to facilitate instant perception by the operator of the equipment's operational status, i.e. the red LED on or the green LED permanently off indicates a fault condition.

1.4.3 Front Panel Description

Components

The Encoder provides a keypad to input data. There are two LED indicators, located on the left of the front panel (see *Figure 1.7*).

Front Panel Status Display and Keyboard

The front panel status display and keyboard are used as a local control method and to set up and configure the Encoder (see *Chapter 4, Operating the Equipment Locally*). They can also be used as quick method for accessing the status of the equipment. The status display, by default, shows the service name of the video channel being encoded, the equipment type indicator and the alarm fail status.

Table 1.6: Front Panel Indicators

Indicator	Colour	Description
Alarm	Red	This LED is lit when an alarm condition has been detected by the Encoder.
Power	Green	This LED is lit when power is being received by the Encoder.

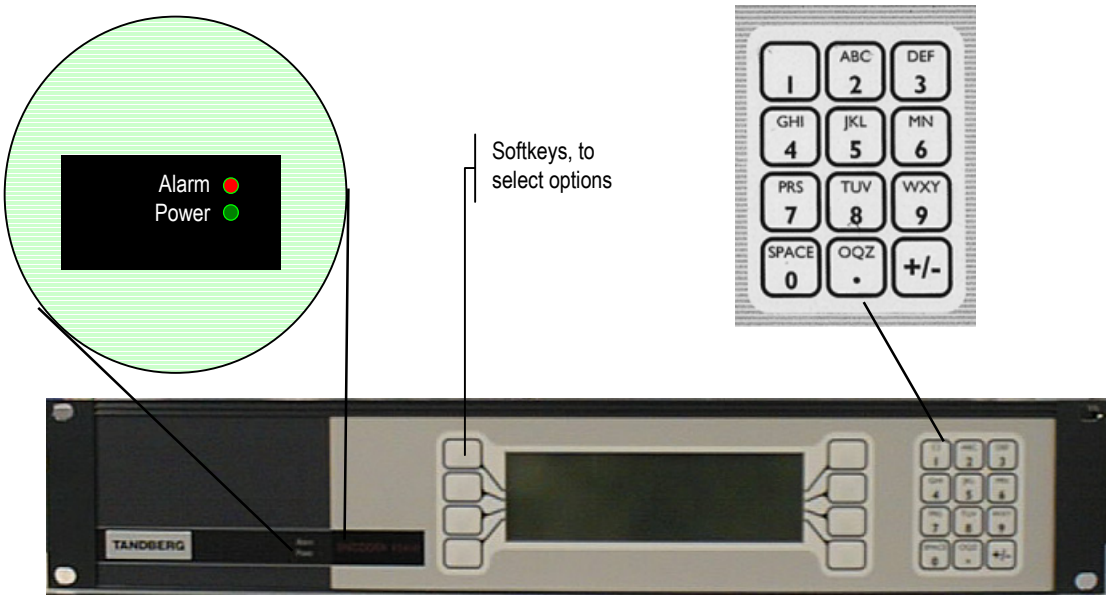

Figure 1.7: Front Panel Indicators

1.4.4 Rear Panel Description

The Encoder provides all the connectors at the rear panel. The connectors depend on whether any of the option modules are fitted. All the connectors, except the power connector, are physically located on the separate modules which comprise the Encoder. Cutaways in the rear panel permit access to them.

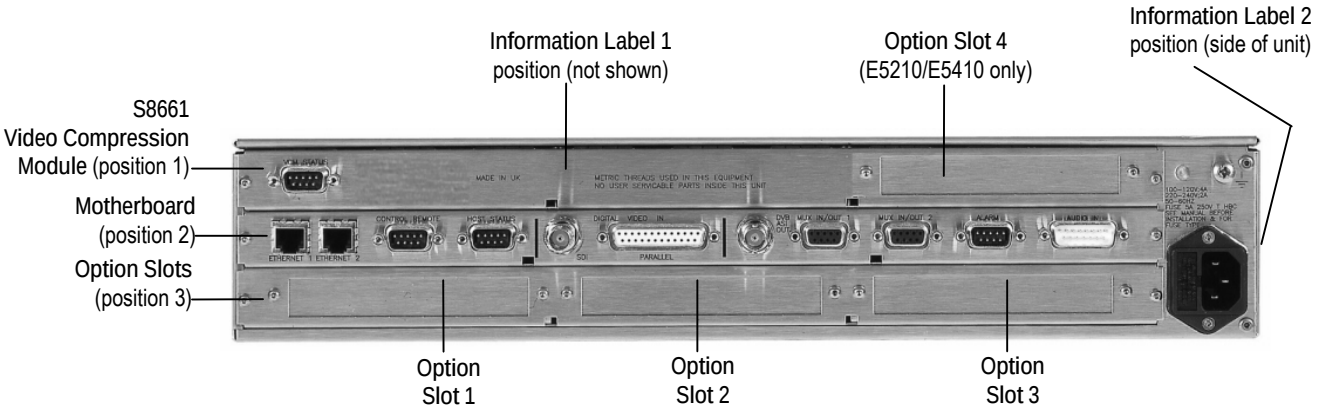

Figure 1.8: Positioning of Rear Panel Component Parts

NOTES...

1. The –48 Vdc version of Encoder type E5610 has a terminal block for power connection (see *Chapter 2, Installing the Equipment, Figure 2.2*) instead of the mains power connection shown in *Figure 1.8)*.
2. *Figure 1.8* shows Models E5210 or E5411 with an S8661 Video Compression Module fitted.

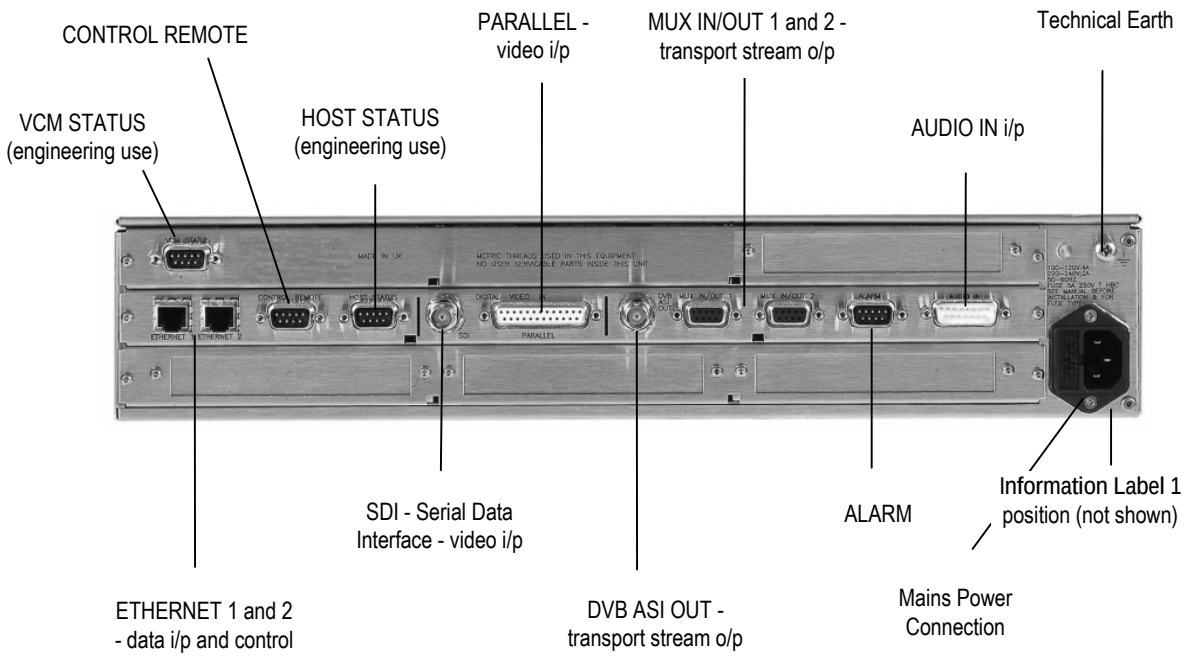

Figure 1.9: Rear Panel Connectors (E5210/E5410)

> NOTE....
>
> The –48 Vdc version of 2U Encoder type E5610 has a terminal block for power connection instead of the mains power connection shown in *Figure 1.9*.

1.4.5 Construction

Enclosure

The Encoder comprises Eurocards/modules mounted horizontally in a screened, self-ventilated cabinet. The 2U high unit can be freestanding or mounted in a 19 inch rack. All inputs and outputs are by way of rear panel connectors.

Boards/Modules in the Basic Encoder

The basic Encoder contains various boards/modules which are factory fitted into the enclosure (see *Table 1.7*). Option modules can be fitted in the remaining slots (see *Chapter 3, Options and Upgrades* and *Figure 1.8*).

Table 1.7: Boards and Modules in the Basic Encoder

Model Number	Position	Card Part Number	Name
E5210	1	S8651/S8661/S8652	Video Compression Module
	2	S8442	Motherboard
E5410	1	S8661/S8652	Video Compression Module
	2	S8442	Motherboard
E5610[/48V]	1	S8860	Video Compression Module
	2	S8442	Motherboard

For module descriptions see *Chapter 5, Equipment Description*. Access to the modules is not required for normal operation and may invalidate the warranty.

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Chapter 2

Installing the Equipment

Contents

List of Figures

List of Tables

2.1 Introduction

2.1.1 Read This First!

The Encoder must be handled carefully and thoughtfully to prevent safety hazards and damage. It is usually supplied as part of a system installed by TANDBERG Television engineers. In any case, ensure the personnel designated to install the unit have the appropriate skills and knowledge. If in any doubt, contact Customer Services.

Follow the instructions for installation and only use installation accessories recommended by the manufacturers.

2.1.2 General

Installation of the Encoder is normally performed by TANDBERG Television personnel. This chapter provides configuration and connection information for planning installations, checking the final set-up in the event of a fault, modifying the requirements or moving the equipment to another location. In the event of problems, contact Customer Services.

2.1.3 Site Requirements

Power Supplies

All M2/ENC/E5x10 Encoders operate from a wide-ranging power supply covering the ranges 100-120 Vac, 60 Hz, or 220-240 Vac, 50 Hz. See *Annex B, Technical Specification* for a full specification.

Encoder Model M2/ENC/E5610/48V operates from a –48 Vdc supply.

Environment

The Encoder is designed for use in ambient air temperature conditions in the range 0°C to +40°C, and humidity 0% to 90% (non-condensing). See *Annex B, Technical Specification* for a full specification.

Do not install this product in areas of high humidity or where there is danger of water ingress.

Lightning Protection

WARNING...

IF THE ENCODER HAS BEEN SUBJECT TO A LIGHTNING STRIKE OR POWER SURGE WHICH HAS STOPPED IT WORKING, DISCONNECT THE POWER IMMEDIATELY. DO NOT REAPPLY POWER UNTIL IT HAS BEEN CHECKED FOR SAFETY. IF IN DOUBT, CONTACT TANDBERG TELEVISION CUSTOMER SERVICES.

Where appropriate, ensure this product has an adequate level of lightning protection. Alternatively, during a lightning storm or when it is left unattended and unused for long periods of time, unplug it from the supply outlet and disconnect the output equipment. This prevents damage to the product due to lightning and power line surges.

2.1.4 EMC Compliance Statements[1]

EN 55022 / AS/NZS 3548

This equipment is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

FCC

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

2.2 Preliminary Checks

2.2.1 Mechanical Inspection

When taking delivery of an Encoder, check the equipment items delivered against the enclosed delivery note. Inspect the equipment for damage in transit. If in doubt, contact Customer Services (see *Preliminary Pages*).

> NOTE...
>
> Do not remove the covers of this equipment as doing so may invalidate any warranties, cause a safety hazard and/or affect the EMC performance. It may also invalidate any safety tests. Check with Customer Services beforehand.

2.2.2 Moving the Equipment Safely

Do not place this product on an unstable cart, stand, bracket, or table. The product may fall, causing serious injury and serious damage to the product. Use only with a cart, stand, bracket or table recommended by TANDBERG Television.

An appliance and cart combination should be moved with care. Quick stops, excessive force, and uneven surfaces may cause the appliance and cart combination to overturn.

Do not move or carry the equipment whilst it is still connected to the supply or other leads, is live or is in operation.

[1] The EMC information was correct at the time of manufacture. The EMC tests were performed with the Technical earth attached.

2.3 Installing the Equipment

2.3.1 Fixing Method

The Encoder can be operated mounted in a 19 inch rack. Ensure that it is firmly and safely located and has an adequate through-flow of air.

Slide the Encoder onto the chassis supports and affix to the rack by means of an M6 x 18 mm panhead screw in each corner.

Do not use this product as a support for any other equipment.

2.3.2 Cable Routing

Power supply cables should be routed so that they are not likely to be walked on or pinched by items placed upon or against them. Pay particular attention to cables at plugs, convenience receptacles, and the point where they exit from the appliance.

Do not run ac power cables in the same duct as signal leads.

2.3.3 Equipment Access

WARNING...

BERYLLIUM COPPER FINGER STRIPS ARE USED IN THIS EQUIPMENT TO SEAL THE ENCLOSURE FOR EMI PROTECTION. THIS ARRANGEMENT IS PERFECTLY SAFE DURING NORMAL OPERATION. DO NOT FILE THE STRIPS OR OTHERWISE CAUSE THEM TO PRODUCE DUST OR PARTICLES. ANY CUTS CAUSED BY THE STRIP SHOULD BE TREATED APPROPRIATELY.

Ensure that the Encoder is installed in such a way to allow access to the rear of the unit in order to be able to gain access to connectors.

2.3.4 Ventilation

WARNING...

NEVER PUSH OBJECTS OF ANY KIND INTO THIS EQUIPMENT THROUGH OPENINGS AS THEY MAY TOUCH DANGEROUS VOLTAGE POINTS OR SHORT-OUT PARTS THAT COULD RESULT IN A FIRE OR ELECTRIC SHOCK. NEVER SPILL LIQUID OF ANY KIND ON THE PRODUCT.

CAUTIONS...

1. Openings in the cabinet are provided for ventilation and to ensure reliable operation of the product and to protect it from overheating, and these openings must not be blocked or covered. This product should never be placed near or over a radiator or heat register. This product should not be placed in a built-in installation such as a rack unless proper ventilation is provided or the instructions have been adhered to.
2. Do not install equipment so that the air intake of one aligns with the outlet on another. Provide baffles and adequate spacing.
3. The fans contained within this unit are not fitted with a dust/insect filter. Pay particular attention to the environment in which it is to be used.

The unit is designed for stationary or fixed use only. Ensure it is firmly and safely located and has an adequate through-flow of air. Allow at least 50 mm free air-space at each side of the equipment. Units in racks can be stacked without ventilation panels between. Racks containing stacked equipment may need to be forced air-cooled to reduce the operating ambient temperature.

Figure 2.1: Air Path through the Enclosure

2.4 AC Mains Operating Voltage and Earthing

2.4.1 AC Power Supply

CAUTION...

This product should be operated only from the type of power source indicated on the marking label. If you are not sure of the type of power supply to your business, consult a qualified electrical engineer or your local power company.

The power supply used in this equipment is a wide-ranging, ac power supply unit designed for use at either 100-120 Vac or 220-240 Vac (see *Annex B, Technical Specification* for a full power supply specification). There are no links or switches to be altered for operation from different ac supplies.

2.4.2 Power Cable and Earthing

General

Check that the ac power cable is suitable for the country in which the Encoder is to be used.

WARNINGS...

1. IF THE MOULDED PLUG FITTED TO THE MAINS CABLE SUPPLIED WITH THIS UNIT IS NOT REQUIRED, PLEASE DISPOSE OF IT SAFELY. FAILURE TO DO THIS MAY ENDANGER LIFE AS LIVE ENDS MAY BE EXPOSED IF THE REMOVED PLUG IS INSERTED INTO A MAINS OUTLET.
2. POWER-SUPPLY CORDS SHOULD BE ROUTED SO THAT THEY ARE NOT LIKELY TO BE WALKED ON OR PINCHED BY ITEMS PLACED UPON OR AGAINST THEM, PAYING PARTICULAR ATTENTION TO CORDS AT PLUGS, CONVENIENCE RECEPTACLES, AND THE POINT WHERE THEY EXIT FROM THE APPLIANCE.

The unit is supplied with a two metre detachable mains supply cable fitted with a moulded plug suitable for the USA, UK or Europe.

The wires in the mains cable are coloured in accordance with the wire colour code shown in *Table 2.1*.

Table 2.1: Supply Cable Wiring Colours

	UK (BS 1363)	EUROPE (CEE 7/7)	USA (NEMA 5-15P)
Earth:	Green-and-yellow	Green-and-yellow	Green
Neutral:	Blue	Blue	White
Live:	Brown	Brown	Black

Protective Earth / Technical Earth

WARNINGS...

1. THIS UNIT MUST BE CORRECTLY EARTHED THROUGH THE MOULDED PLUG SUPPLIED. IF THE LOCAL MAINS SUPPLY DOES NOT HAVE AN EARTH CONDUCTOR DO NOT CONNECT THE UNIT. CONTACT CUSTOMER SERVICES FOR ADVICE.
2. BEFORE CONNECTING THE UNIT TO THE SUPPLY, CHECK THE SUPPLY REQUIREMENTS IN ***ANNEX B***.

The unit has a Technical earth terminal (marked with ⏚) located at the rear panel. Its use is recommended. This is **NOT** a Protective earth for electric shock protection. The terminal is provided to:

1. Ensure all equipment chassis fixed within a rack are at the same Technical earth potential. To do this, connect a wire between the Technical earth terminal and a suitable point on the rack.
2. Eliminate the migration of stray charges when connecting between equipment.

WARNING...

IF THE TERMINAL SCREW HAS TO BE REPLACED, USE AN M4 X 12 mm LONG POZIDRIV PANHEAD. USING A LONGER SCREW MAY CAUSE A SAFETY HAZARD.

Connecting the Encoder to the AC Power Supply

WARNINGS...

1. DO NOT OVERLOAD WALL OUTLETS AND EXTENSION CORDS AS THIS CAN RESULT IN A RISK OF FIRE OR ELECTRIC SHOCK.
2. AS NO MAINS SWITCH IS FITTED TO THIS UNIT, ENSURE THE LOCAL AC POWER SUPPLY IS SWITCHED OFF BEFORE CONNECTING THE SUPPLY CORD.
3. THE ENCODER IS NOT FITTED WITH AN ON/OFF SWITCH. ENSURE THAT THE SOCKET-OUTLET IS INSTALLED NEAR THE EQUIPMENT SO THAT IT IS EASILY ACCESSIBLE. FAILURE TO ISOLATE THE EQUIPMENT PROPERLY MAY CAUSE A SAFETY HAZARD.

To connect the unit to the local ac power supply:

1. Ensure the local ac supply is switched OFF.
2. Ensure the correct fuse type and rating has been fitted to both the equipment and the ac power cable.
3. Connect the ac power lead to the Encoder mains input connector and then to the local mains supply.

2.5 -48 Vdc Input (M2/ENC/E5610/48V)

2.5.1 DC Power Supply

> CAUTION...
>
> This product should be operated only from the type of power source indicated on the marking label. If you are not sure of the type of power supply to your business, consult a qualified electrical engineer.

This product uses a –48 Vdc power supply source (see *Annex B, Technical Specification* for a full power supply specification).

2.5.2 Location of the Input Connector

Figure 2.2 shows the two types of 48 Vdc connector available. The connector is located at the right-hand rear of the equipment.

> WARNING...
>
> THE –48 VDC ENCODER IS NOT FITTED WITH AN ON/OFF SWITCH. ENSURE THAT THE SUPPLY HAS A SUITABLE MEANS OF ISOLATION WHICH IS EASILY ACCESSIBLE. FAILURE TO ISOLATE THE EQUIPMENT PROPERLY MAY CAUSE A SAFETY HAZARD.

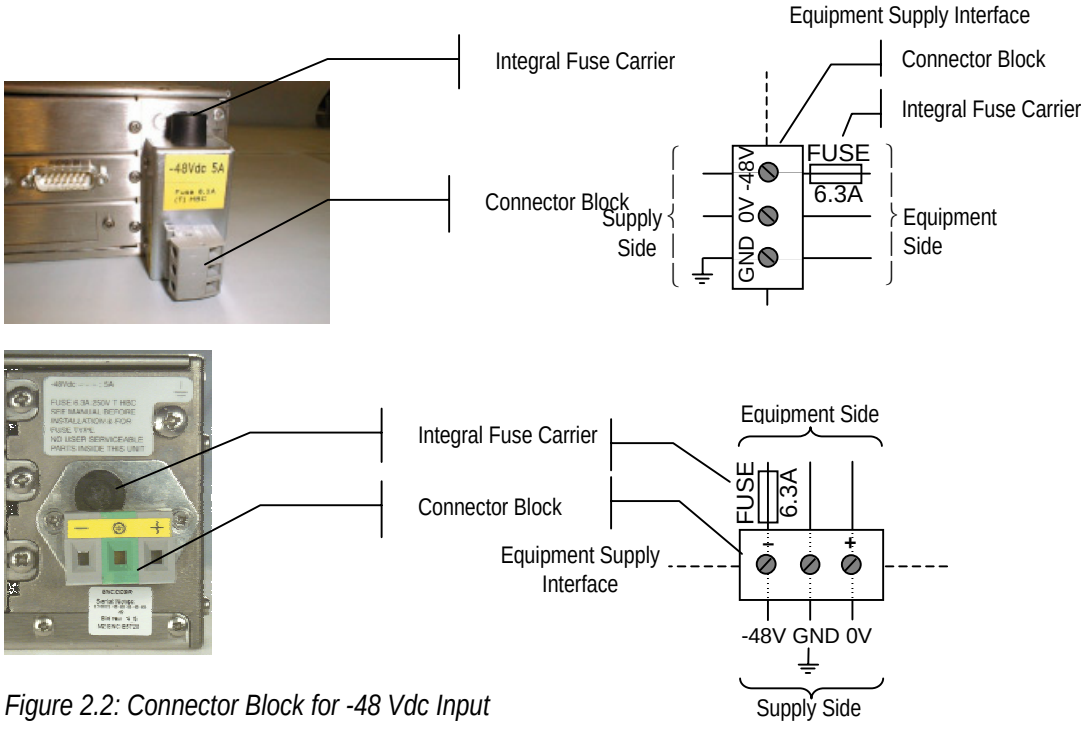


Figure 2.2: Connector Block for -48 Vdc Input

The equipment fuse is held in an integral fuse carrier at the dc power inlet at the rear of the Encoder.

2.5.3 Connecting the Equipment to the DC Power Supply

Connect the Encoder to the local dc power supply as follows.

1. **Local DC Power Supply**
   Ensure the local dc supply is isolated.
2. **Encoder**
   Ensure the correct fuse is fitted.
3. **Supply Cord**
   Connect the dc lead to the Encoder input connector and then to the local dc power supply. Switch on the dc power supply.

2.5.4 Protective Earth / Technical Earth

The unit has a Technical earth terminal (marked with ⏚) located at the rear panel. Its use is recommended. This is **NOT** a Protective earth for electric shock protection. The terminal is provided to:

- Ensure all equipment chassis fixed within a rack are at the same Technical earth potential. To do this, connect a wire between the Technical earth terminal and a suitable point on the rack.
- Eliminate the migration of stray charges when connecting between equipment.

WARNING...

IF THE TERMINAL SCREW HAS TO BE REPLACED, USE AN M4 X 12 mm LONG POZIDRIV PANHEAD. USING A LONGER SCREW MAY CAUSE A SAFETY HAZARD.

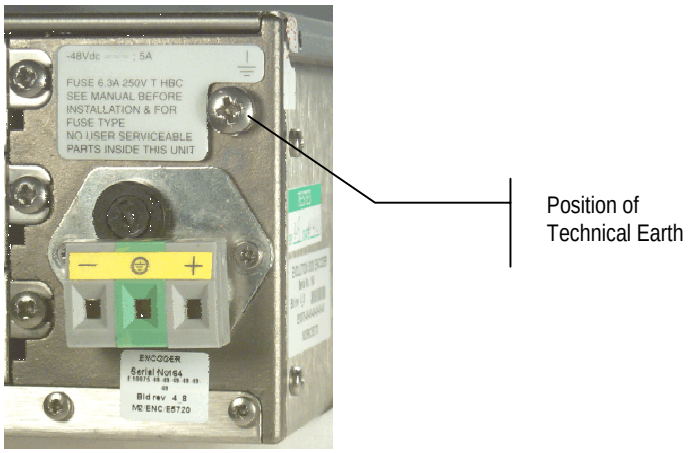


Figure 2.3: Location of the Technical Earth

2.6 Basic Signal Connections

2.6.1 Introduction

All signal connectors are located at the rear panel of the Encoder. For a detailed interface specification see *Annex B, Technical Specification*.

Always use the specified cables supplied for signal integrity and compliance with EMC requirements.

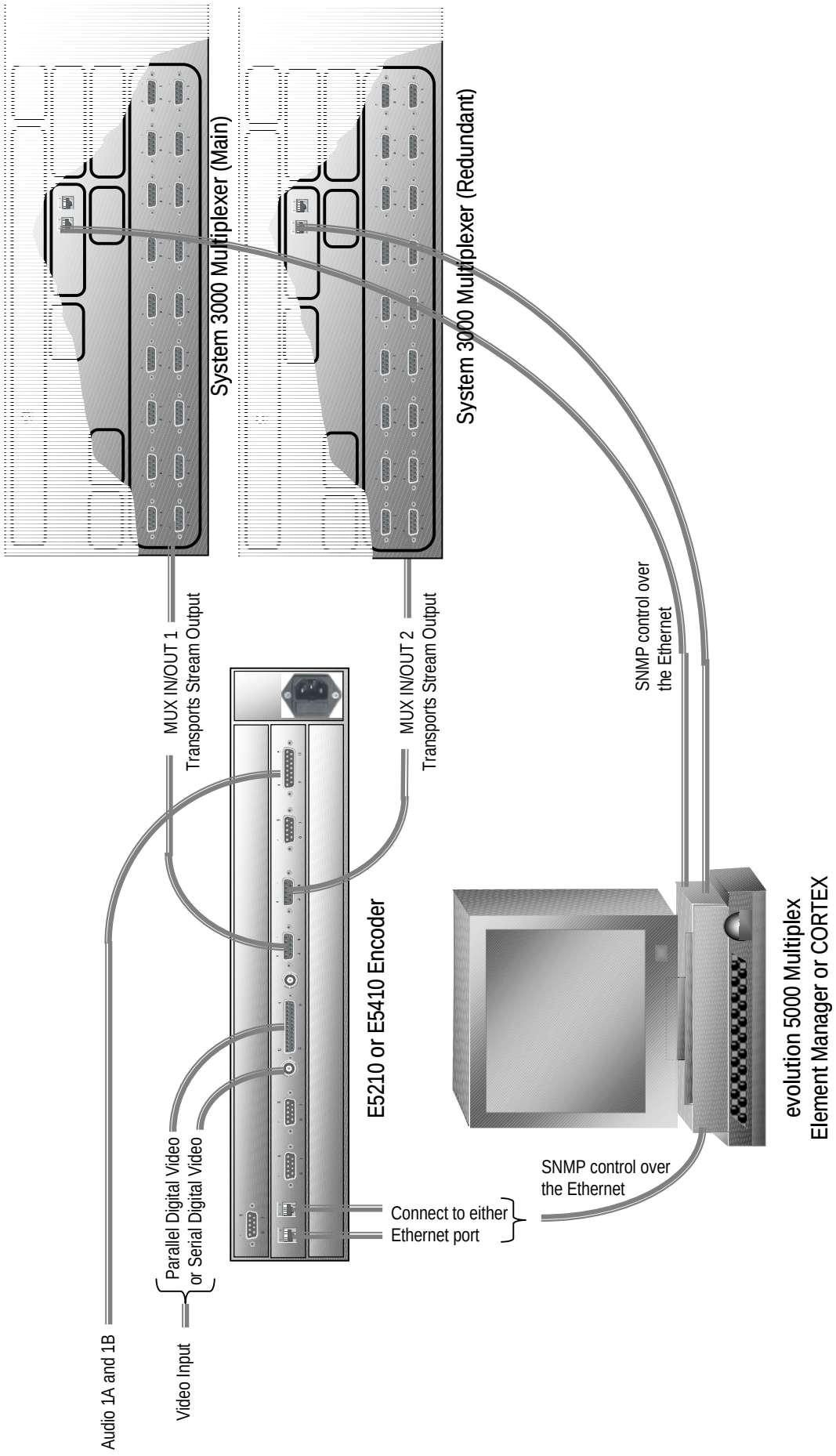
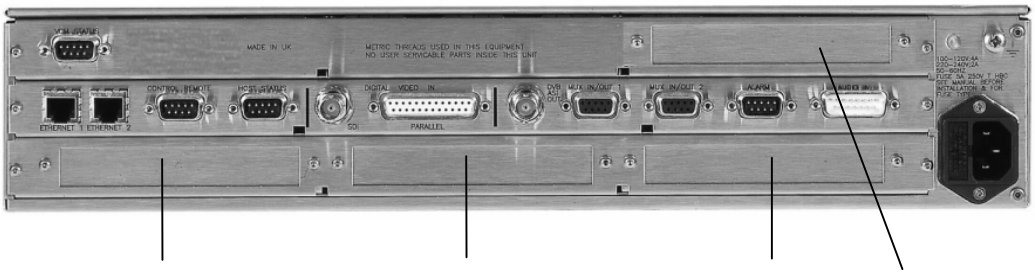
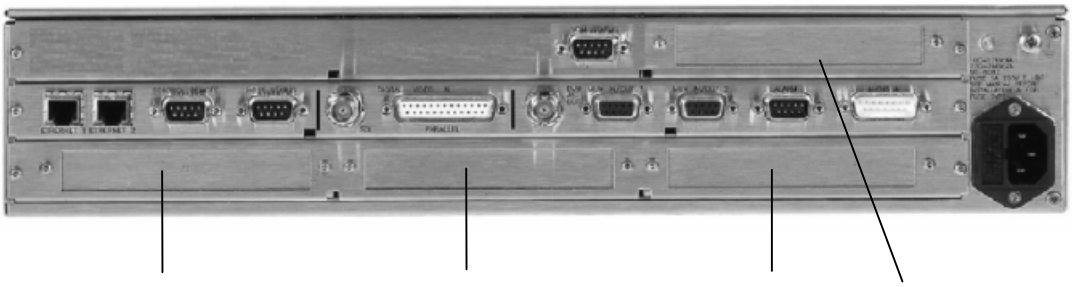


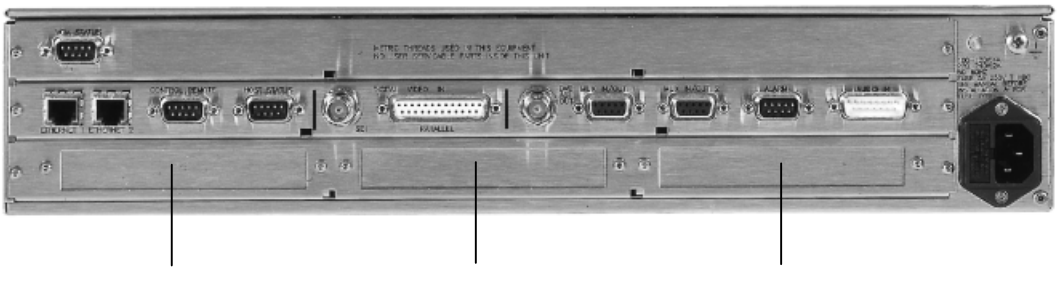
Figure 2.4: Typical Basic Encoder Interconnections



Models E5210/E5410 with S8661 Video Compression Module Fitted



Models E5210/E5410 with S8652 Video Compression Module Fitted



Model E5610

Figure 2.5: Rear Panel Connectors

2.6.2 Connecting up the Basic Encoder

Basic Connections

Once the unit has been installed in its intended operating position, it is ready to be connected up to the rest of the system equipment (*Figure 2.6*), providing it too has been installed (see *Signal Connections* for pin-out details of the connectors).

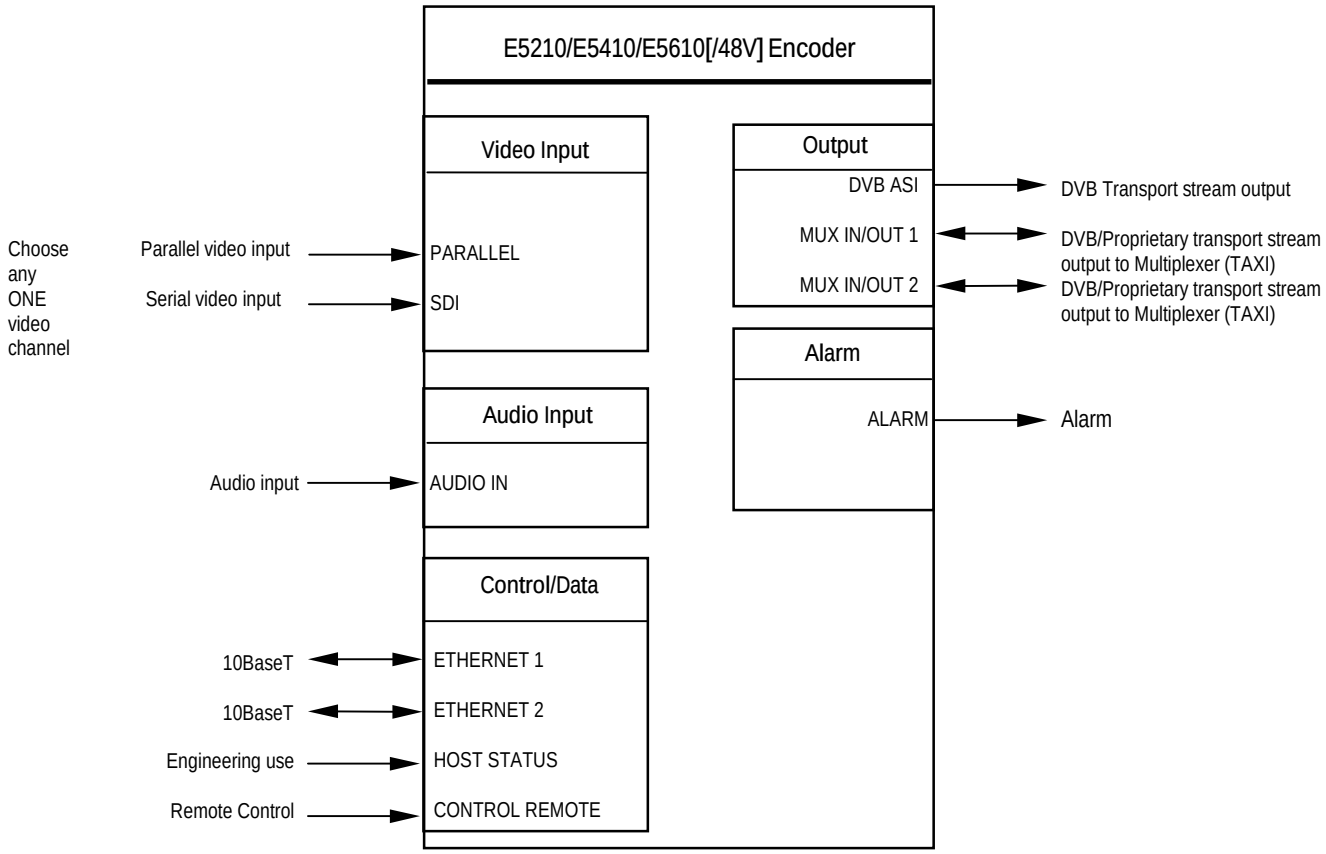


Figure 2.6: Equipment Connections for the Basic Unit

CAUTION...

Do not move or install equipment whilst it is still attached to the mains supply. Ensure ESD precautions are observed whilst interconnecting equipment.

NOTES...

1. The SDI video input can also carry up to four channels of embedded audio.
2. See *Chapter 3* for information relating to Options and Upgrades.

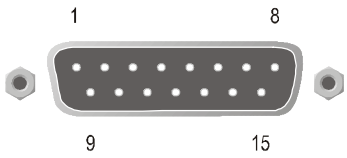
2.6.3 Power Supply

Section 2.4, AC Mains Operating Voltage and Earthing provides details of power supply connection, Protective earthing and safety. Read all the instructions carefully and take note of all warnings and cautions.

2.6.4 Technical Earth

Connect the Encoder's Technical earth to a suitable point.

2.6.5 Audio Inputs



Connect the audio cable to the **AUDIO IN** connector. The 15-way, D-type male connector is used in different ways according to the audio input and the encoding configuration selected.

The connector provides an audio channel which may be used as four channels of analogue audio for configuration as four mono or two stereo audio pairs analogue. Also, by selecting digital audio, the Encoder can operate as a digital AES/EBU audio input on the pins allocated to the analogue audio left channel input.

The Encoder is supplied with a **break out cable** (part number RD.C.MSC1011) which plugs into this connector, and provides a more convenient means of connecting the audio inputs via four XLR female connectors. The cable is labelled for use as a stereo analogue audio.

Table 2.2: Audio In Connector

Analogue Input				AES/EBU Digital Input			
Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	L A (+)	9	L A (-)	1	AES A (+)	9	AES A (-)
2	L A screen	10	R A (+)	2	AES A screen	10	-
3	R A (-)	11	R A screen	3	-	11	-
4	L B (+)	12	L B (-)	4	AES B (+)	12	AES B (-)
5	L B screen	13	R B (+)	5	AES B screen	13	-
6	R B (-)	14	R B screen	6	-	14	-
7	Not connected	15	Not connected	7	Not connected	15	Not connected
8	Chassis ground			8	Chassis ground		

> NOTE...
> In analogue mode termination is either 20 kΩ or 600 Ω. In AES/EBU mode termination in 110 Ω.

Embedded Audio on the SDI input can also be extracted and encoded.

Dolby Digital and **Pre-encoded AC-3 Audio** are only available when the M2/EOM/AUD Additional Audio Option Module (see *Chapter 3*).

2.6.6 Video Inputs

Connection

> NOTE...
> If the Video Input Module is part of the Encoder then both analogue and digital video inputs may be connected but only one is active at a time.

Parallel

A 25-way, D-type female connector provides a parallel digital video input.

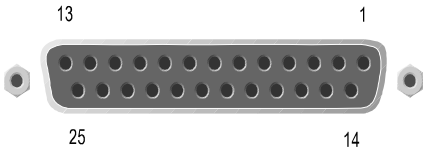


Table 2.3: PARALLEL Connector

Pin	Signal	Pin	Signal
1	Clock (+)	14	Clock (-)
2	System Ground	15	System Ground
3	Data 7 (+) (msb)	16	Data 7 (-) (msb)
4	Data 6 (+)	17	Data 6 (-)
5	Data 5 (+)	18	Data 5 (-)
6	Data 4 (+)	19	Data 4 (-)
7	Data 3 (+)	20	Data 3 (-)
8	Data 2 (+)	21	Data 2 (-)
9	Data 1 (+)	22	Data 1 (-)
10	Data 0 (+)	23	Data 0 (-)
11-12	Not connected	24-25	Not connected
13	Cable Shield		

SDI IN

A 75 Ω BNC connector provides a serial digital video input to the unit. This input is terminated in 75 Ω.

The serial input supports error detection and handling (EDH) as defined by the specification SMPTE RP 165-1994, 'Error Detection Checkwords and Status Flags for Use in Bit Serial Digital Interfaces for Television'. Refer to *Chapter 5*, *Equipment Description* for further information.

Table 2.4: SDI Connector

Pin	Signal
Centre	Video Input
Screen	Ground

NOTES...

1. Up to four channels of **embedded audio** can be carried in the serial video stream. These are chosen using the **Audio Source** and **Embedded Src 12** (audio channels 1 and 2) or **Embedded Src 34** (audio channels 3 and 4) option menus
2. This connector is terminated in 75 Ω.

2.6.7 Output Connectors

MUX IN/OUT 1 and 2

A 9-way, D-type female connector provides a high data rate bi-directional TAXI chip interface to TANDBERG Television supplied multiplexing equipment.

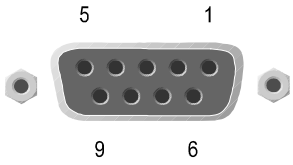


Table 2.5: MUX IN/OUT 1 and 2 Connectors

Pin	Signal	Pin	Signal
1	Rx (+)	5	Tx (+)
2	Rx Ground	6	Rx (-)
3	Protective Ground	7-8	Not connected
4	Tx Ground	9	Tx (-)

DVB ASI Out

Connect the evolution *5000* or third party Multiplexer or Modulator ASI cable to the ASI OUT connector, using good quality 75 Ω coaxial cable.

A 75 Ω BNC connector provides the output from the Encoder.

Table 2.6: DVB ASI Connector

Pin	Signal
Centre	Signal
Screen	Ground

2.6.8 Control Interfaces

Connection

Control of the Encoder is by the Multiplex Control Computer (MCC) over the bi-directional TAXI link from the Multiplexer.
Local control is implemented through the front panel keypad and display. See *Chapter 4, Operating the Equipment Locally* for details of how to access the front panel menus.

Ethernet 1 and 2

An 8-way, RJ-45 connector provides a 10BaseT Ethernet interface for communications with the MCC for control, monitoring and SI/PSI information.

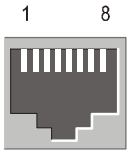


Table 2.7: Ethernet Connector

Pin	Signal	Pin	Signal
1	Tx Out (+)	4-5	Not connected
2	Tx Out (-)	6	Rx In (-)
3	Rx In (+)	7-8	Not connected

Alarm / Fail

If required, connect an external status monitoring device to the **ALARM** connector.

A 9-way, D-type male connector provides an alarm relay interface which can be used to send a signal to remote equipment.

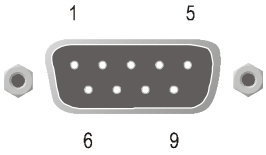


Table 2.8: Alarm Connector

Pin	Signal	Pin	Signal
1	Ground	6	Fail (-)
2	Fail (common)	7	Fail (+)
3	Alarm (-)	8	Alarm (common)
4	Alarm (+)	9	Reset 2
5	Reset 1		

Host Status

A 9-way, D-type male connector acts as a low level interface for communicating with the equipment and functions for test engineers. This is not intended as a customer interface, however this can be used to mask alarm and fail error messages (see *Chapter 6, Preventive Maintenance and Fault-finding*).

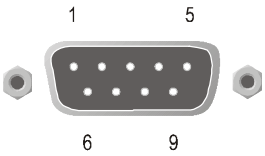


Table 2.9: Host Status Connector

Pin	Signal	Pin	Signal
1	Not connected	4	Not connected
2	Test Rx	5	Ground
3	Test Tx	6-9	Not connected

Control Remote

A 9-way, D-type male connector provides an RS-232/RS-485 port.

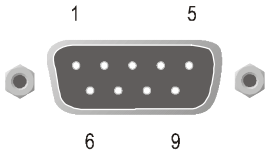


Table 2.10: CONTROL REMOTE Connector

Pin	Signal	Pin	Signal
1	Not connected	6	RS-485 Rx (-)
2	RS-232 Rx	7	RS-485 Tx (+)
3	RS-232 Tx	8	RS-485 Tx (-)
4	Not connected	9	RS-485 Rx (+)
5	Ground		

2.7 Setting up the Encoder for Reflex Operation

2.7.1 Overview

To allow the Encoder to operate in Reflex mode, it must communicate with the Multiplexer on a frame by frame basis. These communications make use of the Ethernet connection on the Encoder motherboard. Messages carry performance information from the Encoder to the Multiplexer and bit-rate instructions from the Multiplexer to the Encoder.

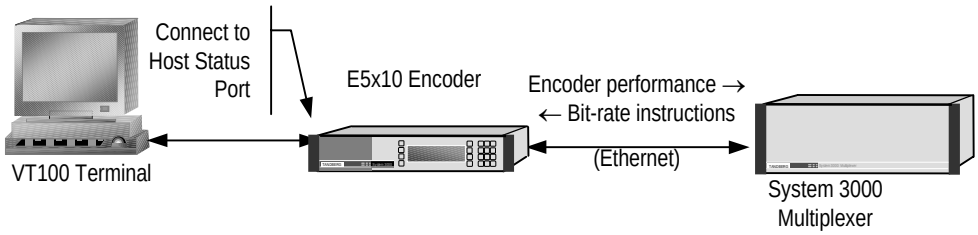


Figure 2.7: Setting Up the Encoder for Reflex Operation

To allow the system to operate correctly, the port number on the Encoder must be set to match that configured for Reflex in the Multiplexer. In a multiple head-end system, each Multiplexer (and its spare if redundant configuration is employed) will be configured to use a different Reflex port number.

Further, it is necessary for the Encoder to be resident on the same IP subnet as the Multiplexer (see *Section 2.8, Setting the Encoder IP Address).*

2.7.2 Procedure

1. Connect a VT100 terminal to the Host Status port on the rear panel of the Encoder.

NOTES...

1. The terminal should be set to 19200 baud, 8 data bits, 1 stop bit, and no parity.
2. Ground is pin 5, and the interconnecting cable is a NULL modem.

2. Press return. The following message is displayed:

```
'Do you want to enter Diagnostics (Y/N) ?'
```

   Press **Y** and a menu will be displayed. Select **b** Configuration Menus followed by **b** Network.

3. Select the option **p** Reflex UDP Cfg Port to set the Config port number and **q** Reflex UDP Op Port to set the Output port number. Once in each edit screen enter the desired number as a decimal followed by **Enter**.

2.8 Setting the Encoder IP Address

2.8.1 Methods of Changing the Encoder IP Address

The Encoder IP address is normally set during manufacture. If for any reason the IP address has to be changed, this can be achieved via the front panel menus or by using an engineering VT100 (RS-232) terminal, connected to the Host Status port of the Encoder.

2.8.2 From the Front Panel Menus

To access the IP Address option from the front panel menus, press the **IP Address** softkey in the `Setup/System/General` Menu. Edit the IP address by use of the keypad and then press the **Enter** softkey.

```
Setup/System/General Edit
------------------------------------------------------------
IP Address                                          | Del
                    172.16.248.91                   | Case
Update using keypad                                 | Enter
                    (Upper case)                    | Quit
```

2.8.3 From the VT100 (RS-232) Terminal

Attach a VT100 (RS-232) terminal to the Host Status port of the Encoder.

The parameters are:

- 19200 baud
- 8 data bits
- 1 stop bit
- no parity

Having connected the terminal:

1. Press **Return**, then **Y**.
2. Press **B** for Configuration menu.
3. Press **B** for Network.
4. Press **A** for IP Address.
5. Enter required IP Address, and press **Return**.
6. Press **Esc** several times to exit diagnostics.

2.9 Implementing ATSC Closed Captions

2.9.1 Overview

There are a number of ways in which ATSC Closed Captions can be inserted into the Encoder. These are described in the following paragraphs.

2.9.2 Using The Digital Video Serial Input

If the Closed Captions are carried in the digital video serial input then:

1. Enable the Line 21 data by selecting the Setup Menu > Video Menu > Closed Caption Menu > **SD Line 21** option
2. Select Setup Menu > Video Menu > Closed Caption Menu > **Closed Caption** TO Enable the extraction of the Closed Captions from the Line 21 data.

2.9.3 Using the Composite Video Input

Closed Captions can be carried in the composite video input when using the **M2/EOM/VID Analogue Video Input Option**.

2.9.4 Using a Closed Caption Generator

If the Closed Captions come from an external generator then:

1. Connect the Generator output to the Control Remote Port
2. Enable the port by selecting Setup Menu > Closed Caption Menu > **Serial CC**

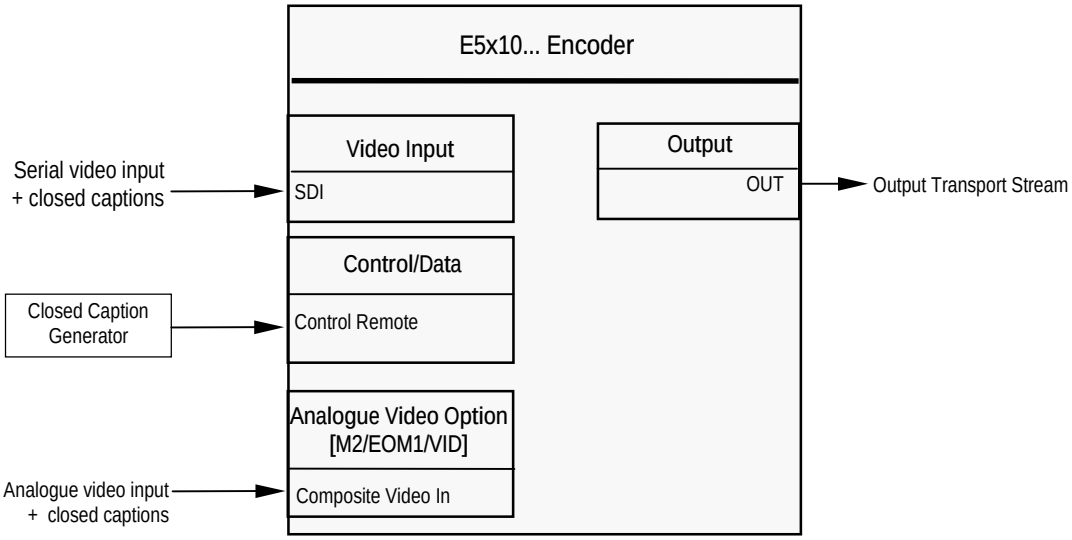


Figure 2.8: Implementing Closed Captions

2.10 Implementing Teletext

2.10.1 Overview

There are a number of ways in which DVB Teletext can be inserted into the Encoder's output transport stream. These are described in the following paragraphs. In all cases, Teletext is enabled as follows:

1. Turn the Teletext function on by selecting Setup Menu > Video Menu > VBI > **Teletext Encode** and choosing the **On** option.
2. The default for the packets carrying the Teletext information is PID is 111 hex (273 denary). If a different PID is required, select Setup Menu > Video Menu > VBI > **Teletext PID** and then enter the identifier.
3. Teletext can be carried in a number of lines. Identify the required line/s by selecting Setup Menu > Video Menu > VBI > **VBI Line n**

> NOTE...
>
> Teletext Encoding is only when Frame Rate is set to 25 Hz or 50 Hz,. The menus are only displayed if the VBI in Picture option is set to Off.

2.10.2 Using The Digital Video Serial Input

Teletext can be carried in the digital video serial input. Use the procedure in *Section 2.10.1.*

2.10.3 Using the PAL Composite Video Input

Teletext can be carried in the PAL composite video input when using the **M2/EOM/VID Analogue Video Input Option**.

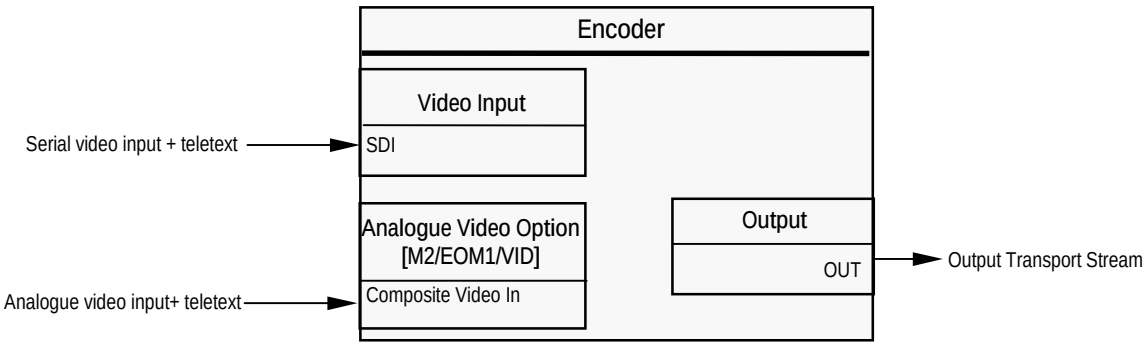


Figure 2.9: Implementing Teletext

2.11 Powering Up/Down

2.11.1 Before Powering Up

Before powering up the Encoder, check that:

1. The unit has been installed in a suitable location.
2. The unit has been connected to external equipment and power supply, as required.
3. The power supply has been checked and a good earth provided.
4. The correct fuse type and rating has been fitted to the equipment and, for the ac supply version, the ac power cable.

2.11.2 Powering Up

To power up the Encoder:

1. Turn on the local power supply. The Encoder executes a series of power-up initialisation and self-test routines.
2. Confirm that the green Power LED is lit and that the red Alarm LED is unlit.

The Encoder has a boot period of approximately 30 seconds. Stable operation within specification is available immediately after the boot period. The Encoder startup screen is displayed.

```
TANDBERG
MPEG-2 Encoder
Version 3.6
xx-xxx-2001
```

> NOTE...
>
> The fans on the Encoder are temperature controlled so may not be on if the ambient temperature is low.

2.11.3 Powering Down

To power down the Encoder remove the power supply connection at the rear of the unit.

BLANK

Chapter 3

Options and Upgrades

Contents

List of Figures

List of Tables

3.1 What's Available

3.1.1 Option Module Functions

The basic Encoder functionality can be enhanced with the inclusion of option modules. Each module consists of a horizontally mounted PCB with rear panel connector space. At **reset**, the software of the basic Encoder detects which modules are fitted and configures them as necessary. The modules can be fitted into the positions indicated in *Table 3.1.*

Table 3.1: Option Module Positions

Marketing Number	Name	Assembly Part No	Card Part No	Option Number	Slot 1	Slot 2	Slot 3	Slot 4[1]
M2/EOM/VID	Analogue Video Input Module	S8481	S8481	1	✓	—	—	—
M2/EOM/AUD	Additional Audio Input Module	S8482	S8482	3	—	✓	✓	—
M2/EOM/QPSK2	Frequency Agile QPSK Modulator Card	S11013	S10949	7	—	✓	✓	✓
M2/EOM/DAT	RS-232 and RS-422 Data Input Module	S8477	S8477	2	—	✓	✓	—
M2/EOM/RAS	RAS Scrambling Module	S8489	S8489	4	—	✓	✓	✓
M2/EOM/BISS	BISS Scrambling Module	S11762	S10501	12	—	✓	✓	✓
M2/EOM/ATM155_MM	STM-1 OC3 Multimode Physical Interface Module (SDH STM-1/SONET STS-3c Multimode Optical)	S8062 + S8063	S8062 + S8063	5	—	✓	✓	✓
M2/EOM/ATM155_SM	STM-1 OC3 Monomode Physical Interface Module (SDH STM-1/SONET STS-3c Monomode Optical)	S8062 + S8067	S8062 + S8067	9	—	✓	✓	✓
M2/EOM/ATM34	PDH/E3 Module	S10217	S8062 + S8068		—	✓	✓	✓
M2/EOM/ATM45	PDH/DS3 Module	S10013	S8062 + S8064		—	✓	✓	✓
M2/EOM/REMUX	Internal Remux Option Module	S10986[2] or S10904[3]	S10655	6	—	—	—	✓
M2/EOM/PSIP	PSIP Insertion Option	S10811	S10655	13	—	—	✓	—
M2/EOM/SSI	SMPTE 310 (SSI) and ASI Optical Output Module	S11147	S10724	11	—	✓	✓	✓
—	Blank Module	S11216 M01	S8065 M01	49	✓	✓	✓	✓

NOTE...

Empty option module slots, except for slot 2, must be fitted with a blank module (S8445) to enable the correct air-flow through the equipment. Slot 2 (see *Table 3.1*) can be fitted with a blanking plate (S8500) alone.

[1] Only Models E5210 and E5410 have a fourth option slot.
[2] Use S10986 Remux assembly in the E5210/E5410 Encoder if an S8661 Video Compression Module is fitted.
[3] Use S10904 Remux assembly in the E5210/E5410 Encoder if an S8652 Video Compression Module is fitted.

3.1.2 How to Find What Modules are Fitted

Option Modules

Any fitted option modules are displayed on the Version Info display. *Figure 3.1* shows how to find the display.

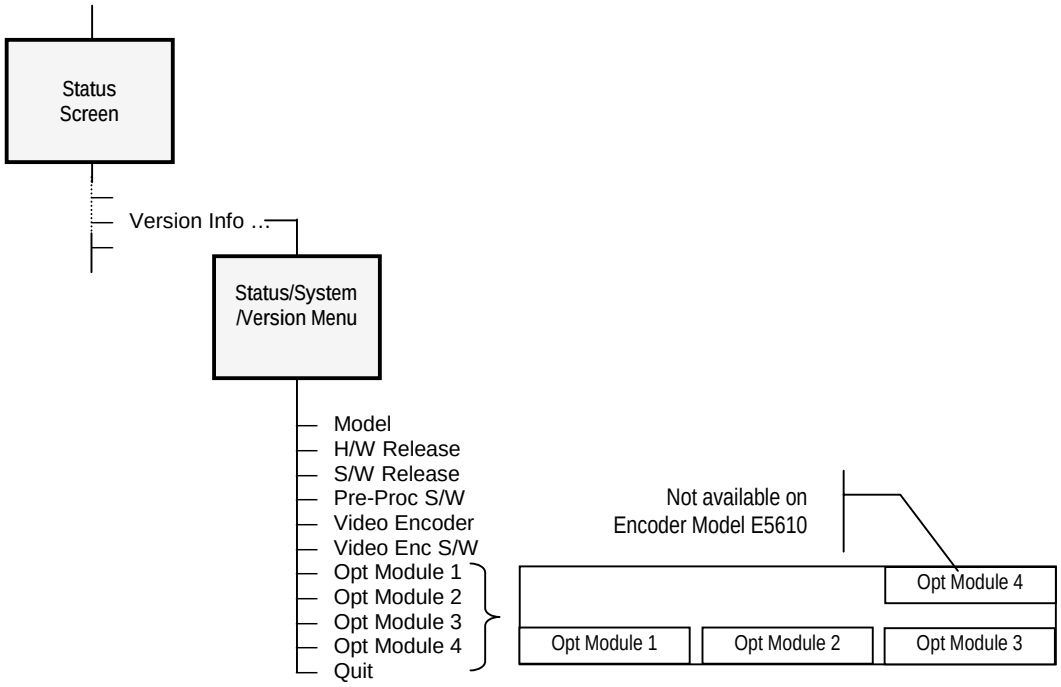


Figure 3.1: Displaying the Fitted Modules

Software Enabled Options

If a software option has been enabled, it is available in the appropriate menu. There is no single place, unlike the option modules, where they can be viewed as a group.

3.1.3 Excluded Combinations

Table 3.2: Excluded Combinations

Module	Excluded Combination	Comments
M2/EOM/RAS RAS Scrambling	M2/EOM/BISS BISS Scrambling	BISS and RAS are always an excluded combination.
M2/EOM/BISS BISS Scrambling	M2/EOM/RAS RAS Scrambling	

3.2 Analogue Video Input Option (M2/EOM/VID)

3.2.1 Overview

The Video Input Module provides the Encoder with high quality analogue video inputs via three BNC connectors. The input format is either composite video (PAL B/D/G/H/I/M and NTSC-M) or component Y, C_R, C_B. The Setup/Video/Source menu associated with this option is described in *Table 4.32* in *Chapter 4*. For a specification of this interface see *Annex B, Technical Specification*.

3.2.2 Assembly

Rear Panel

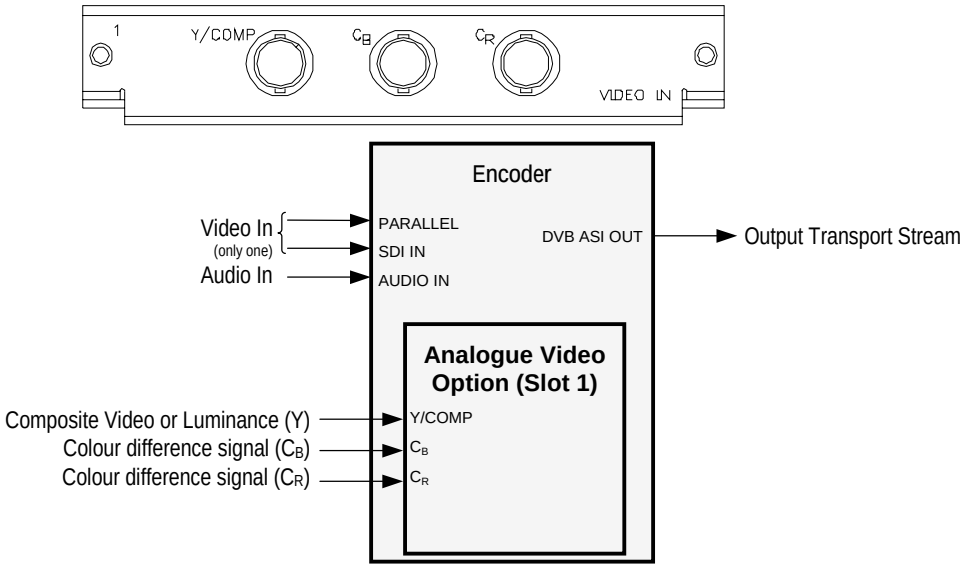


Figure 3.2: Analogue Video Input Option (M2/EOM/VID)

The Analogue Video Input Option comprises Assembly S10923 and Card S8481. This option module can only be installed in slot 1.

Y/COMP, C_B and C_R Connectors

Three 75 Ω BNC connectors provide a high quality analogue video input to the unit. The input can be either composite or YC_BC_R video.

NOTES...

1. The additional video input source is defined using the Setup/Video/Source menu. Unused inputs need not be disconnected.
2. The inputs are isolated from the chassis to prevent 50 Hz/60 Hz hum (only Issue 2 and above of the S8481).

Table 3.3: Y/COMP, C_B and C_R Connectors

Pin	Signal
Centre	Video Input
Screen	Video Input Return

3.3 Additional Audio Option (M2/EOM/AUD)

3.3.1 Overview

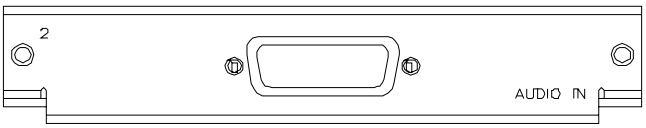
The Audio Option Module supplements the audio encoding functionality of the Encoder. This module supports audio standards MPEG-1 (layer 2) and Dolby Digital. The module can take audio in as either stereo analogue or digital AES/EBU (on left channel only) via a 15-way D-type connector provided on its rear panel.

Alternatively, one of the four pairs of embedded AES/EBU channels extracted from the video can be routed to the module for encoding. This option supports all the standard bit-rates and encoding modes associated with each compression standard.

The Audio menu associated with this option is described in *Section 4.5*.

3.3.2 Assembly

Rear Panel



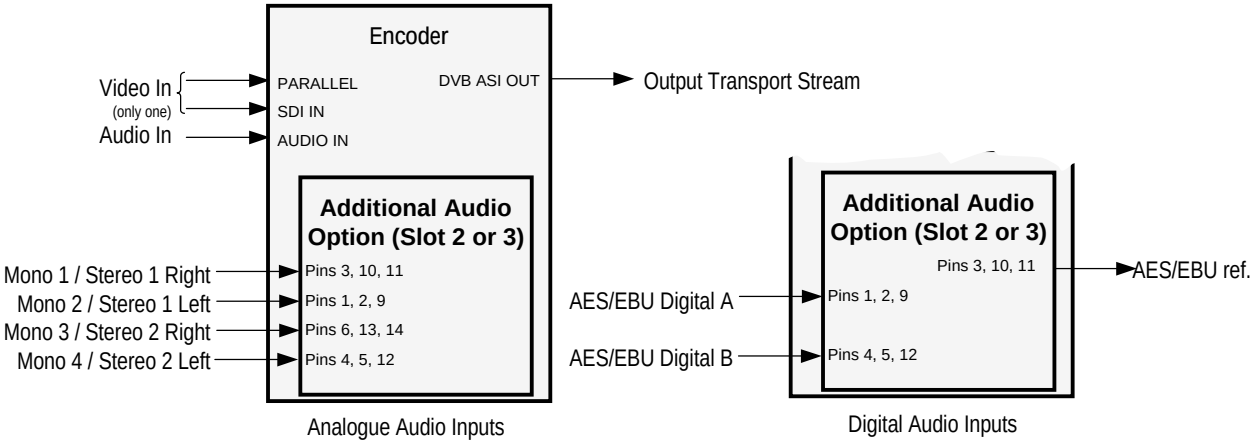


Figure 3.3: Additional Audio Option (M2/EOM/AUD)

The Additional Audio Option comprises Assembly S10927 and Card S8482. This option module can only be installed in slots 2 and 3. Both slots can be used simultaneously.

Audio In Connector

A 15-way, D-type male connector provides an audio channel which may be used as four channels of analogue audio for configuration as four mono or two stereo audio pairs analogue. Also, by selecting digital audio, the Encoder can operate as a digital AES/EBU audio input on the pins allocated to the analogue audio left channel input.

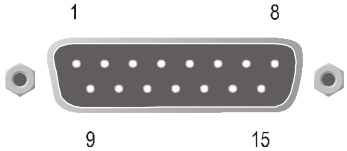


Table 3.4: Audio In Connector

Analogue Input			
Pin	Signal	Pin	Signal
1	L A (+)	9	L A (-)
2	L A screen	10	R A (+)
3	R A (-)	11	R A screen
4	L B (+)	12	L B (-)
5	L B screen	13	R B (+)
6	R B (-)	14	R B screen
7	Not connected	15	Not connected
8	Chassis ground		

AES/EBU Digital Input			
Pin	Signal	Pin	Signal
1	AES A (+)	9	AES A (-)
2	AES A screen	10	-
3	-	11	-
4	AES B (+)	12	AES B (-)
5	AES B screen	13	-
6	-	14	-
7	Not connected	15	Not connected
8	Chassis ground		

NOTE...
In analogue mode termination is either 20 kΩ or 600 Ω. In AES/EBU mode termination in 110 Ω.

On channel 1 only, the right inputs can be reconfigured to output a reference AES/EBU signal for an external Dolby Digital (AC-3) encoder

Table 3.5: Audio Encoder Genlock Connector

AES/EBU Digital Input			
Pin	Signal	Pin	Signal
1	-	9	-
2	-	10	AES OP A (+)
3	AES OP A (-)	11	AES A screen
4	-	12	-
5	-	13	-
6	-	14	-
7	Not connected	15	Not connected
8	Chassis ground		

3.4 RS-232 and RS-422 Data Input Option (M2/EOM/DAT)

3.4.1 Overview

The RS-232 and RS-422 Data Input Option Module offers supplementary data inputs in systems in which an Ethernet style data input is insufficient. It comes with an RS-422 synchronous data input and an RS-232 asynchronous data input. These inputs have been designed for backward compatibility to existing System 3000 Encoders. RS-232 data is input on a dedicated 9-way D-type connector and RS-422 data is input on a dedicated 15-way D-type connector.

RS-442 supports n x 64 kbit (up to 2.048 Mbit/s) or n x 56 kbit (up to 1.792 Mbit/s) data rates where n = 32 max. The RS-232 input can support data baud rates of 1.2 k - 38.4 kbaud. RS-422 data can be time-delayed for synchronisation. The time-delay is only accessible via the debug terminal of the Encoder (in non-MEM operation).

3.4.2 Assembly

Rear Panel

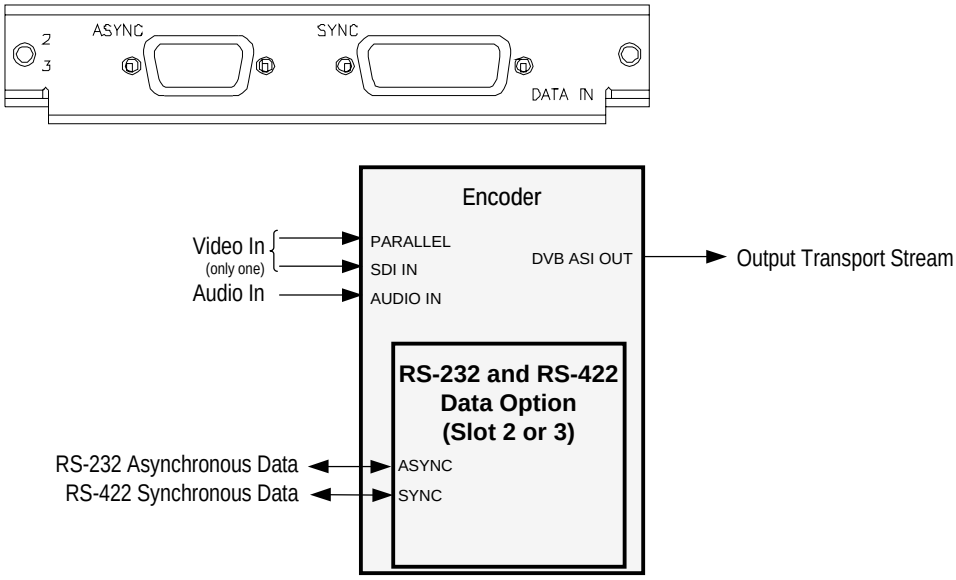


Figure 3.4: RS-232 and RS-422 Data Input Option (M2/EOM/DAT)

The RS-232 and RS-422 Data Input Option comprises Assembly S10919 and Card S8477. This option module can only be installed in slots 2 and 3. Both slots can be used simultaneously.

Async Connector

A 9-way, D-type female connector provides an RS-232 asynchronous, serial communications data input interface.

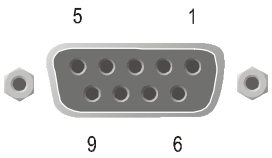


Table 3.6: Async Connector

Pin	Signal	Pin	Signal
1	Output DCD (Data Carrier Detect)	6	Output DSR (Data Set Ready)
2	Output RxD (Receive Data)	7	Not connected
3	Input TxD (Transmit Data)	8	Output CTS (Clear To Send)
4	Not connected	9	Not connected
5	Ground		

NOTE...
XON/XOFF flow control is implemented on pin 2.

Sync Connector

A 15-way, D-type female connector provides an RS-422 synchronous, serial communications data input interface.

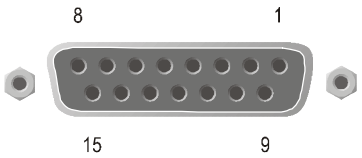


Table 3.7: Sync Connector

Pin	Signal	Pin	Signal
1	Protective Ground	9	Input TXD (-) (Transmit Data)
2	Input TXD (+) (Transmit Data)	10	Input DTR (-) (Data Terminal Ready)
3	Input DTR (+) (Data Terminal Ready)	11	Output RXD (-) (Receive Data)
4	Output RXD (+) (Receive Data)	12	Output DSR (-) (Data Set Ready)
5	Output DSR (+) (Data Set Ready)	13	Output RXC (-) (Receive Clock)
6	Output RXC (+) (Receive Clock)	14	Input TXC (-) (Transmit Clock)
7	Input TXC (+) (Transmit Clock)	15	Not connected
8	Signal Ground		

3.5 Frequency Agile QPSK Modulator Option (M2/EOM/QPSK2)

3.5.1 Overview

The Frequency Agile QPSK Modulator is an internal satellite Modulator module. It plugs into the Encoder backplane and accepts an MPEG-2 transport stream directly from the Encoder's internal program Multiplexer, or via the RAS or BISS scrambling module over a synchronous parallel interface. The Modulator performs energy-dispersal scrambling, Reed-Solomon encoding, convolutional interleaving, convolutional encoding, symbol mapping, baseband shaping and modulation, in accordance with the EN 300 421 specification.

The Modulator module provides QPSK modulation in the frequency range 70 MHz ± 20 MHz, and outputs data at a symbol-rate defined by the source equipment (Encoder). The spectrum of the QPSK signal can be set to Normal and Inverted states. The convolutional FEC rate can be selected from values 1/2, 2/3, 3/4, 5/6, and 7/8. Output power can be programmed in the range -20 dBm to +5 dBm.

3.5.2 Allocating PIDs

When this module is fitted, additional menu options are added to allow PIDs to be allocated. These are for Video, Audio and Data.

To be DVB compliant, PIDs below 32 are reserved. Therefore PIDs 32 to 8191 are available for use. In the event of a clash, one of the PIDs will be changed by the Encoder's internal checking algorithm.

3.5.3 Assembly

Rear Panel

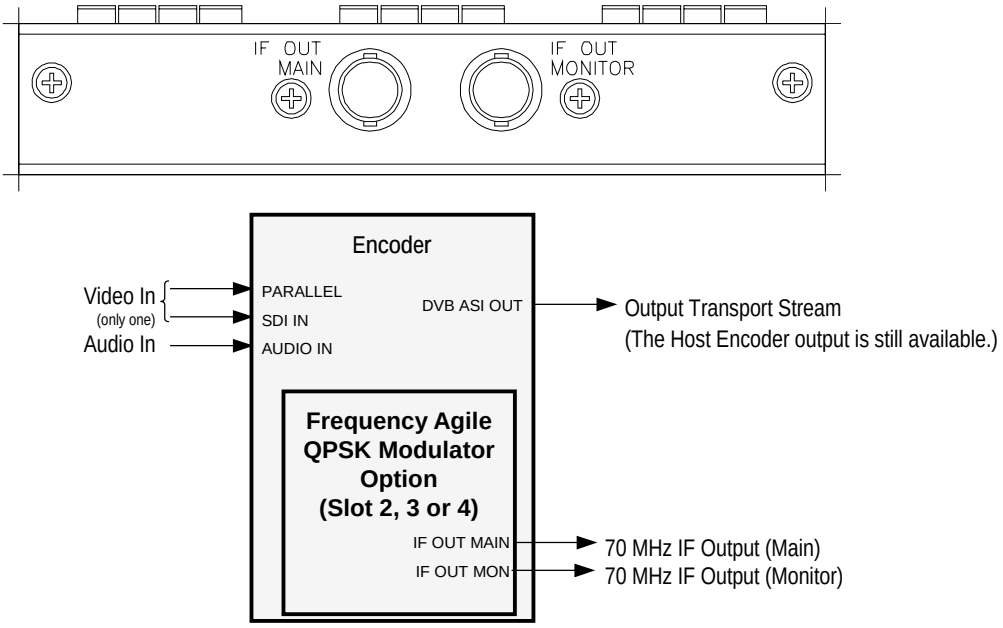


Figure 3.5: Frequency Agile QPSK Modulator Option (M2/EOM/QPSK2)

The Frequency Agile QPSK Modulator Option comprises Assembly S11013 and Card S10949. This option module can only be installed in slots 2, 3 and 4.

IF OUT MAIN Connector

A 75 Ω BNC connector provides the 70 MHz IF output.

Table 3.8: IF Out Main Connector

Pin	Signal
Centre	Signal
Screen	Ground

IF OUT MONITOR Connector

A 75 Ω BNC connector provides an output for monitoring the IF signal. This output is always enabled.

Table 3.9: IF Out Monitor Connector

Pin	Signal
Centre	Signal
Screen	Ground

3.6 ATM Network Interface Option Module (M2/EOM/ATM155_...)

3.6.1 Overview

The ATM[4] Network Interface Module allows the Encoder to transmit and receive MPEG-2 transport streams over broadband telecoms networks (B-ISDN) using ATM.

There are different variants of the ATM Network Interface Module. The module comprises the S8062 ATM Network Interface (common to all models) and a Physical Layer Module suitable for the application required. Refer to *Table 3.1* for details of the variants.

Menus associated with the ATM Modules are described in *Section 4.9*.

3.6.2 Assembly

The ATM Network Interface Module comprises Assembly S10012 and Cards S8062 + Physical Layer Module.

To provide the interface to the B-ISDN telecoms network, the Physical Layer Module must be installed according to the type of network required. These are described in *Section 3.6.4,* STM-1 OC3 Multimode Physical Interface Module (M2/EOM/ATM155_MM) on *page 3-12* and *Section 3.6.5, STM-1 OC3 Monomode Physical Interface Module (M2/EOM/ATM155_SM)* on *page 3-14*.

The S8062 has the following connectors: DVB-ASI Copper Input, DVB-ASI Copper Output and the Ethernet Connector. They are present on all variants of the ATM Module.

3.6.3 Common Connectors

DVB-ASI Copper Input

A BNC, female 75 Ω connector provides a DVB-PI compliant copper connection at a fixed line transmission rate of 270 Mbit/s.

Table 3.10: DVB-ASI Copper Input Connector

Item		Specification
Safety status		SELV
Type		Analogue
Connector designation		DVB ASI-C IN
Connector type		BNC 75 Ω socket
Pin-outs:	Centre Shield	Signal Ground/Chassis

[4] ATM is the abbreviation for Asynchronous Transfer Mode.

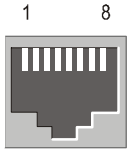
DVB-ASI Copper Output

A BNC, female 75 Ω connector provides a DVB-PI compliant copper connection at a fixed line transmission rate of 270 Mbit/s.

Table 3.11: DVB-ASI Copper Output Connector

Item		Specification
Safety status		SELV
Type		Analogue
Connector designation		DVB ASI-C OUT
Connector type		BNC 75 Ω socket
Pin-outs:	Centre Shield	Signal Ground/Chassis

10BaseT Ethernet Connector



The Ethernet is used to connect the ATM card to a local control LAN and for engineering access. Connect the Ethernet cable to the RJ-45 (10BaseT) connectors on the equipment.

Table 3.12: Ethernet Connector

Item	Specification	
Type	RJ-45	
Connector designation	Ethernet	
Location	At rear panel	
Pin: (Unused pins not connected)	Pin 1 — Tx Out (+) Pin 2 — Tx Out (-)	Pin 3 — Rx In (+) Pin 6 — Rx In (-)

3.6.4 STM-1 OC3 Multimode Physical Interface Module (M2/EOM/ATM155_MM)

Assembly

The STM-1 OC3 Multimode Physical Interface Module comprises Assembly S10012 and Cards S8062 + S8063. This option module can be installed in slot 2, 3 or 4.

> NOTE...
> Slot 4 is not available in Encoder models E5610.

For details of the DVB-ASI Copper Input, DVB-ASI Copper Output and Ethernet Connector refer to *Section 3.6, ATM Network Interface Option Module (M2/EOM/ATM155_...)* on *page 3-11*.

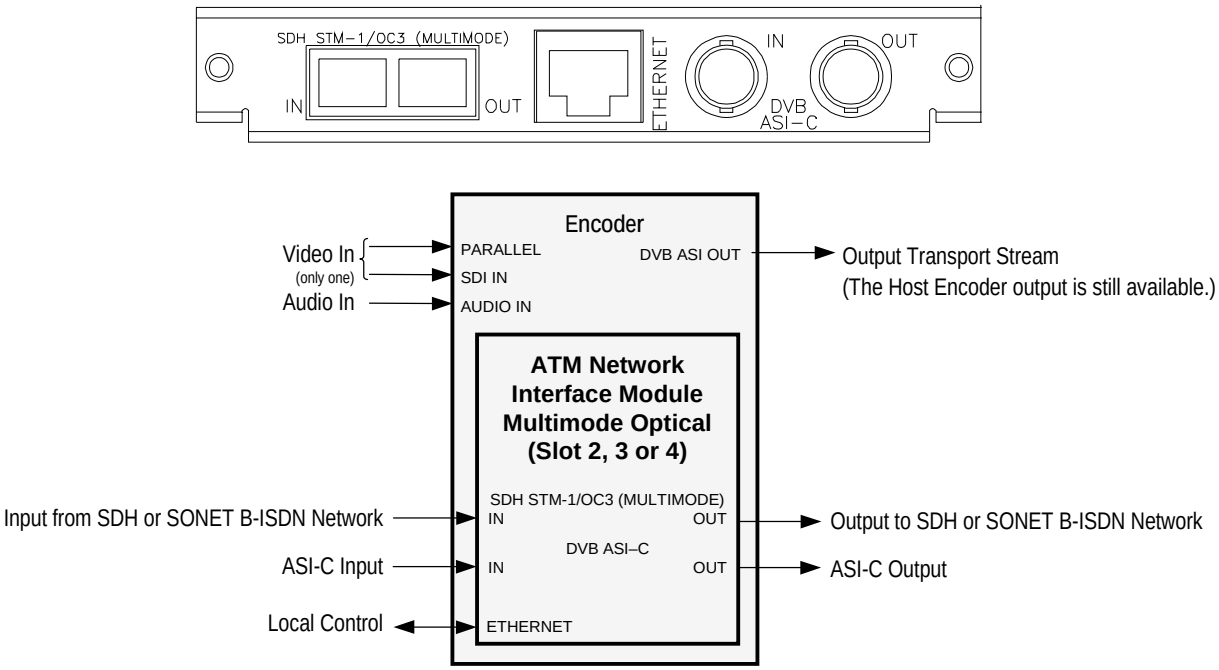


Figure 3.6: ATM Network Interface Module, Multimode Optical (M2/EOM/ATM155_MM)

Multimode Fibre Optic Connector

WARNING...
LED: CLASS I LASER PRODUCT
DO NOT LOOK INTO THE APERTURE.
LOOKING INTO THE APERTURE COULD CAUSE DISCOMFORT TO YOUR EYE.

NOTES...
1. The Class 1 LED warning is as defined in paragraph 5.2 of EN 60825-1 1994.
2. The B-ISDN network that is supported is the SDH STM-1/SONET STS-3c Multimode Optical.

This port is available on the S8063 physical layer option module. It provides a bi-directional interface to an SDH or SONET B-ISDN network, at a fixed line transmission rate of 155.520 Mbit/s. This is a full duplex device.

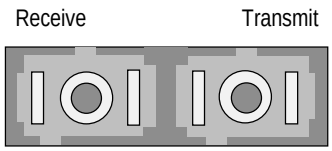


Table 3.13: Multimode Fibre Optic Connector

Item	Specification
Connector type	SC type
Connector designation	SDH STM-1/OC3 (MULTIMODE)
Wavelength	1300 nm Multimode (MMF)

NOTE...
The module is supplied with a protective sealing cap, which protects the optical components from ingress of dust and foreign bodies. The protective sealing cap should be fitted during transit and whenever the interface is not in use.

3.6.5 STM-1 OC3 Monomode Physical Interface Module (M2/EOM/ATM155_SM)

Assembly

The ST-1 OC3 Monomode Physical Interface Module comprises Assembly S10012 and Cards S8062 + S8067. This option module can be installed in slot 2, 3 or 4.

Details of the DVB-ASI Copper Input and Output and Ethernet Connector are given in *Section 3.6*, ATM Network Interface Option Module (M2/EOM/ATM155_...) on *page 3-11*.

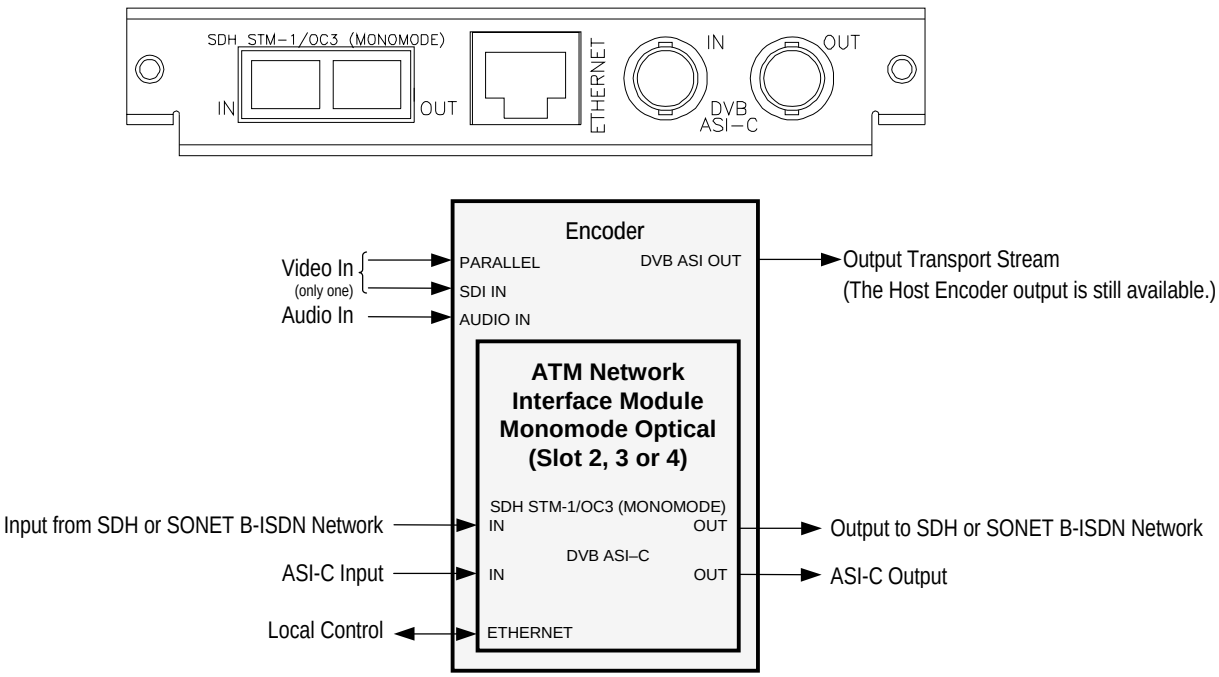


Figure 3.7: ATM Network Interface Module, Monomode Optical (M2/EOM/ATM155_SM)

Monomode Fibre Optic Connector

WARNING...

LASER: CLASS I LASER PRODUCT

DO NOT LOOK INTO THE APERTURE.

LOOKING INTO THE APERTURE COULD CAUSE DISCOMFORT TO YOUR EYE.

NOTES...

1. The Class 1 LASER warning is as defined in paragraph 5.2 of EN 60825-1 1994.
2. The B-ISDN network that is supported is the SDH STM-1/SONET STS-3c Monomode Optical.
3. The module is supplied with a protective sealing cap, which protects the optical components from ingress of dust and foreign bodies. The protective sealing cap should be fitted during transit and whenever the interface is not in use.

This port is available on the S8067 physical layer option module. It provides a bi-directional interface to an SDH or SONET B-ISDN network, at a fixed line transmission rate of 155.520 Mbit/s. This is a full duplex device.

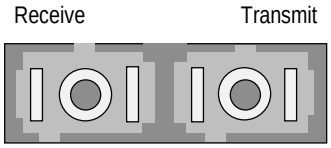


Table 3.14: Monomode Fibre Optic Connector

Item	Specification
Connector type	SC type
Connector designation	SDH STM-1/OC3 (MONOMODE)
Wavelength	1300 nm Monomode / Singlemode (SMF)

3.7 M2/EOM/ATM34 PDH/E3 Module

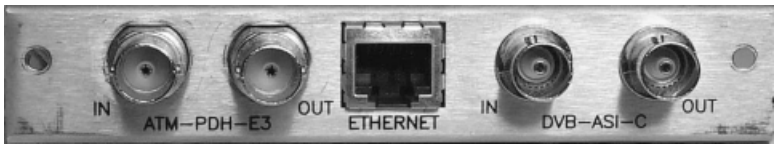
3.7.1 Assembly

The PDH/E3 Physical Interface Module comprises Assembly S10217 and Cards S8062 + S8068. This option module can be installed in slots 2, 3 or 4 (when available).

At the time of publication, there are two ways to transmit ATM cells over E3. They are:

- G.832 ADM (which is more bandwidth efficient)
- G.751 PLCP

Details of the DVB-ASI Copper Input and Output and Ethernet Connector are given in *ATM Network Interface Option Module (M2/EOM/ATM155_...)* on *page 3-11*.



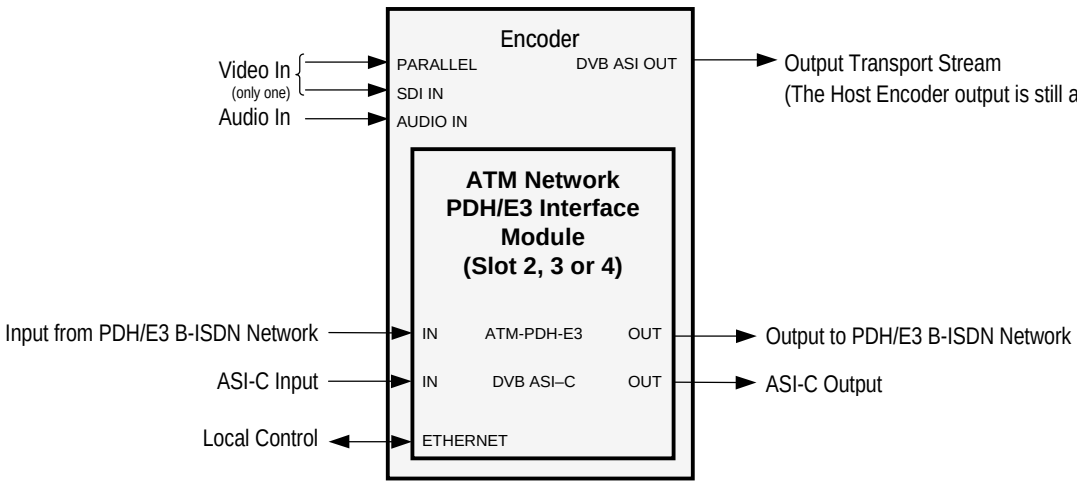


Figure 3.8: Rear Panel Connectors (M2/EOM/ATM34 ATM PDH/E3 Module)

3.7.2 Connectors

This port is available on the S10217 physical layer option module. It provides a bi-directional interface to a PDH/E3 network at a transmission rate of 34.368 Mbit/s. This is a full duplex service.

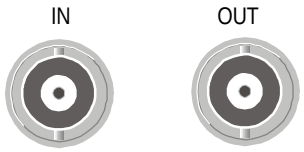


Table 3.15: PDH/E3 Connector

Item	Specification
Connector type	BNC
Connector designation	ATM-PDH-E3

3.8 M2/EOM/ATM45 PDH/DS3 Module

3.8.1 Assembly

The PDH/DS3 Physical Interface Module comprises Assembly S10013 and Cards S8062 + S8064. This option module can be installed in slot 2, 3 or 4 (when available).

Details of the DVB-ASI Copper Input and Output and Ethernet Connector are given in ATM Network Interface Option Module (M2/EOM/ATM155_...) on *page 3-11*.

DS-3 is the third level in the PDH multiplex hierarchy found in North America. DS-3 has a bandwidth of 44.736 Mbit/s and carries seven DS-2 channels of 6.312 Mbit/s, these in turn carry four DS-1 signals of 1.544 Mbit/s.

There are currently four different ways to transmit ATM cells over DS-3. They are:

- C-bit parity ADM (this option is more bandwidth efficient)
- C-bit parity PLCP
- M23 ADM
- M23 PLCP

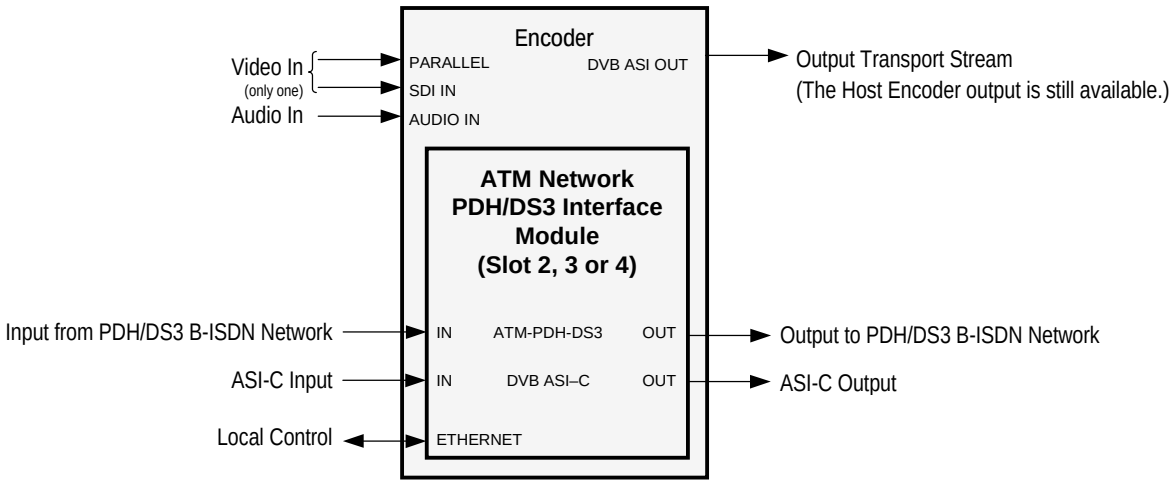


Figure 3.9: Rear Panel Connectors (M2/EOM/ATM34 ATM PDH/DS3 Module)

3.8.2 Connectors

This port is available on the S10013 physical layer option module. It provides a bi-directional interface to a PDH/DS3 network at a transmission rate of 45 Mbit/s. This is a full duplex service.

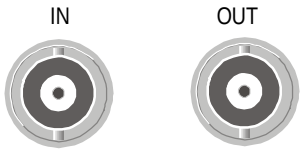


Table 3.16: PDH/DS3 Connector

Item	Specification
Connector type	BNC
Connector designation	ATM-PDH-DS3

3.9 Internal Remux Option (M2/EOM/REMUX)

3.9.1 Overview

The Internal Remux Option Module is capable of accepting up to three separate transport streams via ASI connectors and is under the control of the host Encoder. The functionality allows four transport streams to be multiplexed together, permitting Encoders to be applied to Multiple Channels Per Carrier (MCPC) applications. For a specification of this interface see *Annex B, Technical Specification*.

Menus associated with this option are given in *Section 4.8.4*.

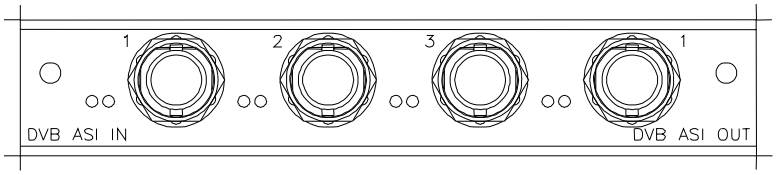
3.9.2 Assembly

Rear Panel

The Internal Remux Option comprises assembly S10811 and Card S10655. This option module can only be installed in slot 4.

NOTE...

This module is only suitable for use with Encoder models E5210 and E5410.



CAUTION...

When remultiplexing, be aware that both PIDs and Service Names will be remapped according to the Host Encoder input used.

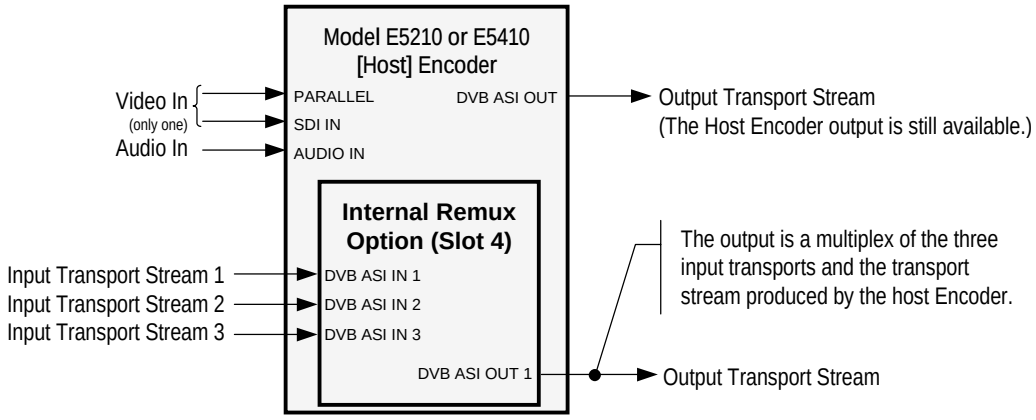


Figure 3.10: Internal Remux (M2/EOM/REMUX) Option

How Remux Deals with Clashing Service Names

There can be up to four programmes carried in each input transport stream. These are numbered: 2, 3, 4 and 5 for input 1; 6, 7, 8, 9 for input 2 and 10, 11, 12, 13 for input 3.

If two input transport streams carry programmes with the same service name then one of them is appended with the appropriate programme number.

> CAUTION...
>
> It is the first instance (the lowest number transport stream input) of the service name that is changed. To avoid confusion, ensure that Service Names are unique.

DVB ASI IN 1, 2 and 3 Connectors

A 75 Ω BNC connector provides an input to the unit.

Table 3.17: DVB ASI In Connector

Pin	Signal
Centre	Signal
Screen	Ground

> NOTE...
>
> When connecting the inputs, always start from DVB ASI IN 1 and work up.

DVB ASI OUT 1 Connector

A 75 Ω BNC connector provides an output from the unit.

Table 3.18: DVB ASI Out Connector

Pin	Signal
Centre	Signal
Screen	Ground

3.10 PSIP Insertion Option (M2/EOM/PSIP-IN)

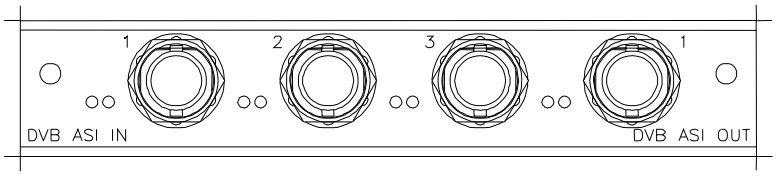
3.10.1 Assembly

PSIP Insertion Option (M2/EOM/PSIP-IN) The PSIP Insertion Option comprises assembly S10811 and Card S10655. This option module can only be installed in slot 3.

The PDH/E3 Physical Interface Module comprises Assembly S10217 and Cards S8062 + S8068. This option module can be installed in slot 3.

Details of the DVB-ASI Copper Input and Output and Ethernet Connector are given in *ATM Network Interface Option Module (M2/EOM/ATM155_...)* on *page 3-10.*

The external connections are shown under *Section 3.9*, *Internal Remux Option (M2/EOM/REMUX).*



3.10.2 Interconnection

The PSIP Insertion Option allows a PSIP stream to be integrated with the multiplex constructed by an Encoder (see *Figure 3.11*).

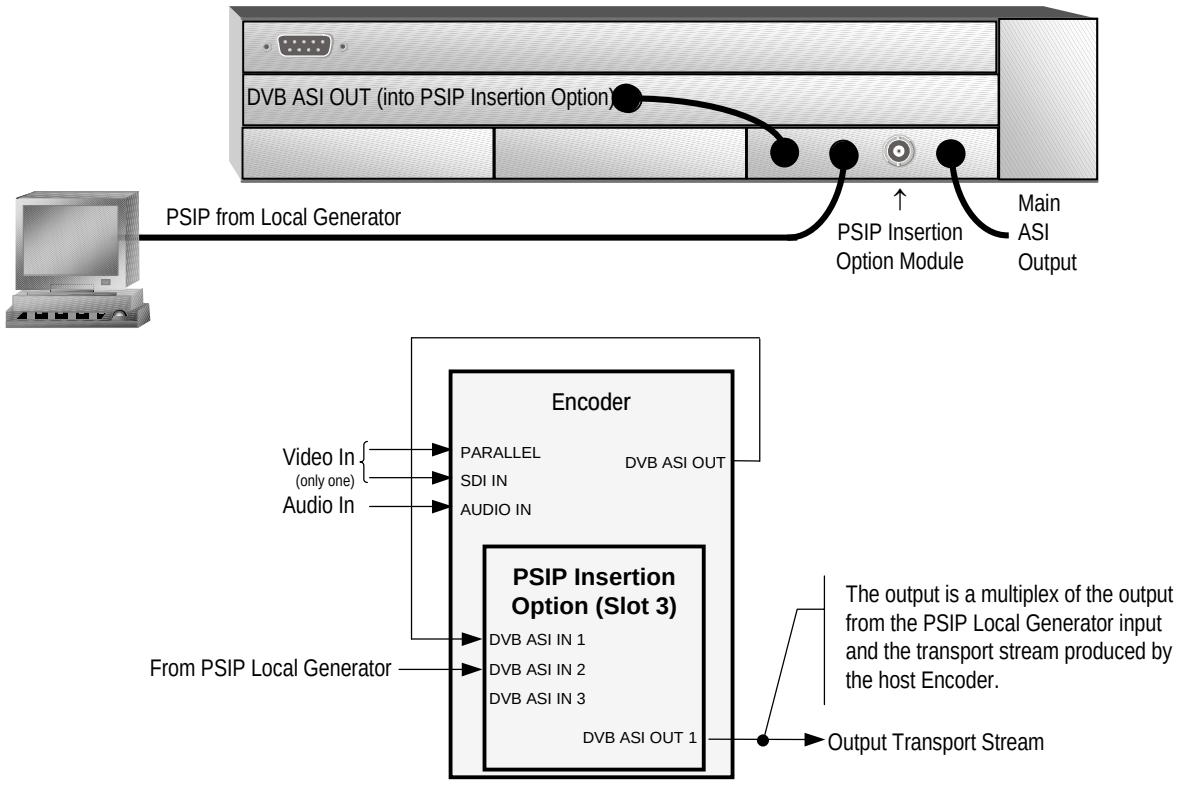


Figure 3.11: Connecting the PSIP Local Generator

3.11 SMPTE 310 (SSI) and ASI Optical Outputs Option Module (M2/EOM/SSI)

3.11.1 Overview

The Module allows the Encoder to output MPEG-2 transport streams in the following formats: ASI (optical) and SMPTE 310M - 1998 (electrical).

There are two ASI multimode optical outputs which conform to the DVB document A010 (*Section 4.4* and *Annex B*) and three copper SI outputs which conform to the SMPTE Standard 310M Level 2.

> NOTE...
> Level 2 performance is exceeded but not as far as that of level 3.

3.11.2 Assembly

Rear Panel

The SMPTE 310/ASI Output Module comprises Assembly S11147 and Card S10724. This option module can only be installed in slots 2, 3 and 4.

> CAUTION...
> The SMPTE 310 output cannot be used with the M2/EOM/RAS RAS Scrambling Module.

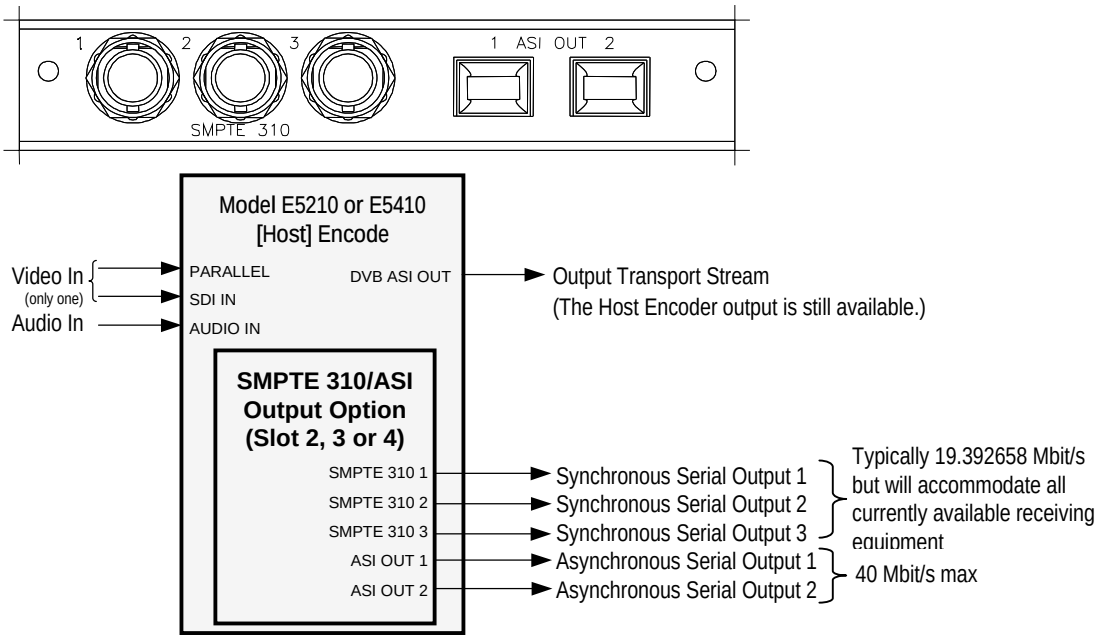


Figure 3.12: SMPTE 310/ASI Output Option Module (M2/EOM/SSI)

SMPTE 310 1, 2 and 3 Connectors

A 75 Ω female BNC connector provides an SMPTE 310 compliant synchronous serial (SSI) output for the unit.

Table 3.19: SMPTE 310 Connector

Pin	Signal
Centre	Signal
Screen	Ground

ASI OUT 1, 2 Connectors

Provides a DVB compliant ASI optical output at 270 Mbit/s.

Table 3.20: ASI Out Connector

Item	Specification
Connector type	SC type
Connector designation	ASI OUT 1, 2
Wavelength	1300 nm Multimode (MMF)

NOTE...

The module is supplied with a protective sealing cap, which protects the optical components from ingress of dust and foreign bodies. The protective sealing cap should be fitted during transit and whenever the interface is not in use.

WARNING...

LED: CLASS I LASER PRODUCT

DO NOT LOOK INTO THE APERTURE.

LOOKING INTO THE APERTURE COULD CAUSE DISCOMFORT TO YOUR EYE.

NOTE...

The Class 1 LED warning is as defined in paragraph 5.2 of EN 60825-1 1994.

3.12 RAS Scrambling Module (M2/EOM/RAS)

3.12.1 Overview

The RAS Module is used to scramble the services in a transport stream so that unauthorised users are denied access. It uses TANDBERG Television's proprietary Remote Authorisation System (RAS 1) which supports two methods of key entry: SNG Key mode or Fixed Link operation. The module can be located in option module slots 2, 3 or 4.

NOTE...

Option module slot 4 is only available in the E5210 and E5410.

In SNG Key mode, a seven digit key is entered via the front panel on the Encoder. In Fixed Link mode, an 8 digit key is assigned by TANDBERG Television and pre-programmed into the Encoder and Receiver. Scrambling can be switched on and off under user control.

The input to the module is the Motherboard Multiplexer output via the backplane. The output is presented on the backplane as well as three dedicated ASI outputs. The backplane output is used when further processing is to be performed on the scrambled transport stream.

Examples of the backplane output being used would be when a RAS Module is used in conjunction with an Internal QPSK Module or an ATM Network Interface Module. Three ASI outputs are provided, so that in addition to the output, both monitor and redundancy connections can be catered for.

3.12.2 Assembly

Rear Panel

The Remote RAS CA Module comprises Assembly S10929 and Card S8489. This option module can only be installed in slot 2, 3 or 4.

> NOTE...
> Slot 4 is not available in Encoder model E5610.

RAS scrambling (when fitted) is controlled via the Setup/Mux menu.

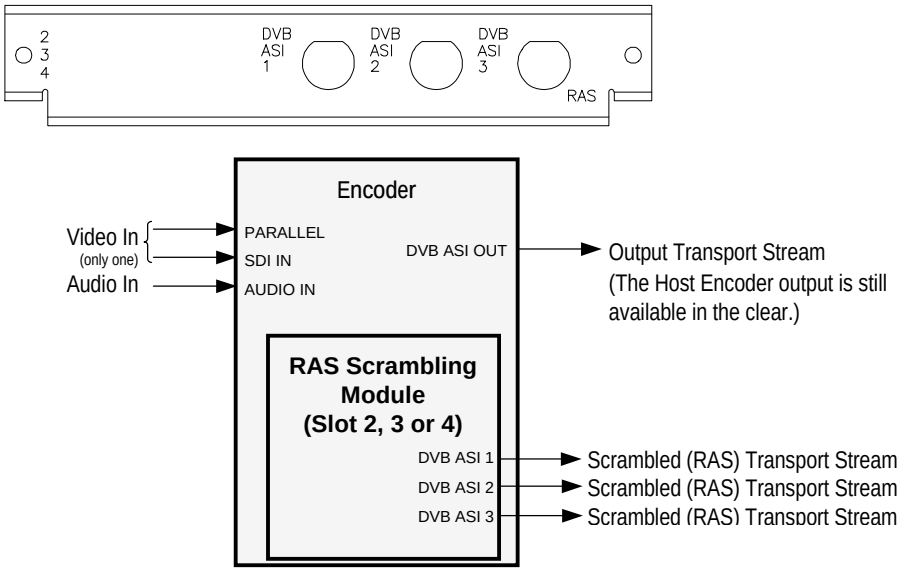


Figure 3.13: RAS Scrambling Module (M2/EOM/RAS)

DVB ASI 1, 2, 3 Connectors

75 Ω BNC connectors provides outputs from the unit.

Table 3.21: DVB ASI Connector

Pin	Signal
Centre	Signal
Screen	Ground

3.13 Basic Interoperable Scrambling System - BISS - Option Module (M2/EOM/BISS) – V3.3 on

3.13.1 Overview

With the appropriate configuration, the Encoder can use BISS to scramble the outgoing transport stream. This system has been developed by the European Broadcasting Union (EBU) as an open scrambling system.

BISS has three main levels of operation: Mode 1, Mode 2 and Mode 3. Mode 0 corresponds to no scrambling.

> NOTE...
> Only Modes 0 and 1 are available at this release.

BISS Mode 1 operation uses a fixed value for the control word to scramble the services in the transport stream from the Encoder. To descramble the transmission, the Alteia needs to have the matching control word value.

BISS Modes 2 and 3 are not supported at this release.

The Basic Interoperable Scrambling System, BISS Module comprises Assembly S11762 and Card S10501. This option module can only be installed in slot 2, 3 or 4.

BISS scrambling (when fitted) is enabled and controlled via the Setup/Mux menu (see *Section 4.8.2*).

3.13.2 Assembly

Rear Panel

When fitted, the BISS module is enabled and controlled via the Setup/Mux menu.

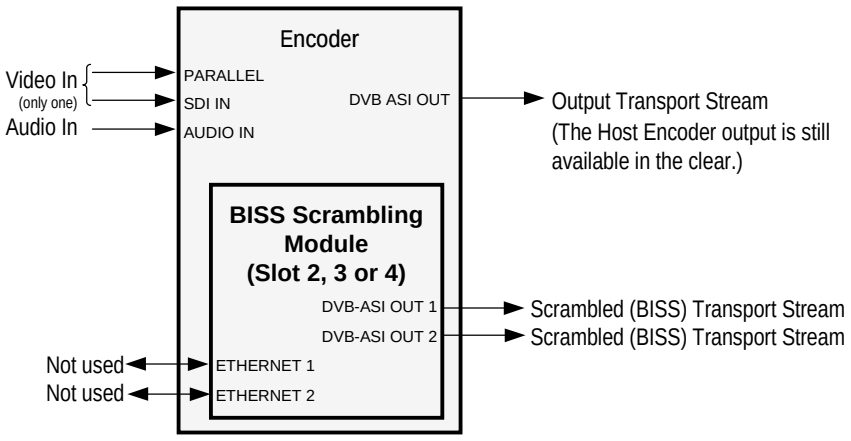


Figure 3.14: Basic Interoperable Scrambling System – BISS - Option Module (M2/EOM/BISS) – V3.3 on

DVB-ASI OUT 1, 2 Connectors

75 Ω BNC connectors provide outputs from the unit.

Table 3.22: DVB-ASI OUT 1 and 2 Connectors

Pin	Signal
Centre	Signal
Screen	Ground

3.14 Encoder Model E5210 Upgrade (M2/EOM/422UPGRADE)

This purchasable option upgrades the Encoder model E5210 to include 4:2:2 video encoding mode. This is equivalent to Model E5410. Contact Customer Services for details.

3.15 Provision of Dolby Digital (M2/EOM/DOLBY-AC3)

> NOTE...
>
> Provision of Dolby Digital requires the Encoder to be fitted with the M2/EOM/AUD option module and a licence to be purchased.

This purchasable option allows the Encoder to provide Dolby Digital audio. Contact Customer Services for details.

Chapter 4

Operating the Equipment Locally

Contents

List of Figures

List of Tables

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4.1 How to Operate the Equipment Locally

4.1.1 Introduction

The front panel display and keypad may be used to configure, control and monitor the Encoder when a Multiplex Control Computer is not used.

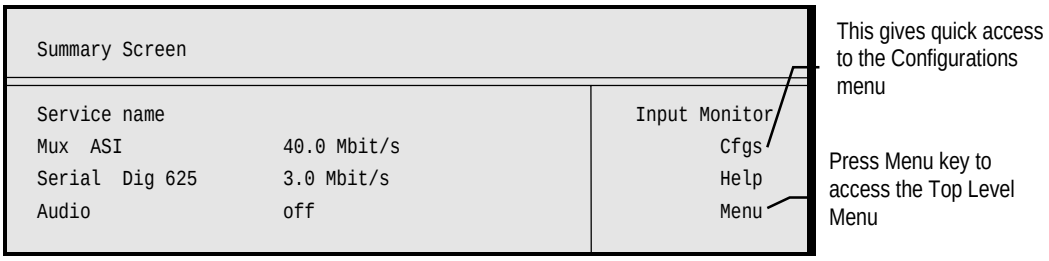
4.1.2 Quick Reference Guide

If you are an experienced user, you may just need a reminder of some of the more typical functions. *Annex H* brings together the operations you need to set the Encoder to work quickly.

4.1.3 Establishing Local Control (Summary Screen)

Install the Encoder as specified in *Chapter 2, Installing the Equipment* and switch on.

At switch-on the Encoder runs through a boot sequence which includes a series of self-tests. If the self-tests are successfully completed, the `Summary Screen` is displayed.



If the tests are not successfully completed the summary screen is still displayed, followed by the applicable error messages. The error messages may be removed by pressing the **Quit** softkey or they time out after a designated period. See *Chapter 6, Preventive Maintenance and Fault-finding* for a list of the possible messages with an explanation and any relevant remedial action. Unless the errors are of a serious nature and stop the Encoder from working then normal operation may be resumed after remedial action has been taken.

> NOTE...
> The `Configurations` menu ia also accessible through the `System Menu` (see *page 4-35*).

4.2 Navigating the Display Screens

4.2.1 Moving Through the Menu Screens

Each of the menu items on the display has a connection to a softkey (see *Figure 4.1*). Press the associated softkey to select the required option and then use the keypad on the far right of the display to change options (unless indicated otherwise in the display). The last item in the right-hand corner of each menu is `Quit`. This causes the display to revert to the previous menu in the hierarchy. The screens displayed in this manual are only representations - there might be differences between equipment, depending upon the options chosen.

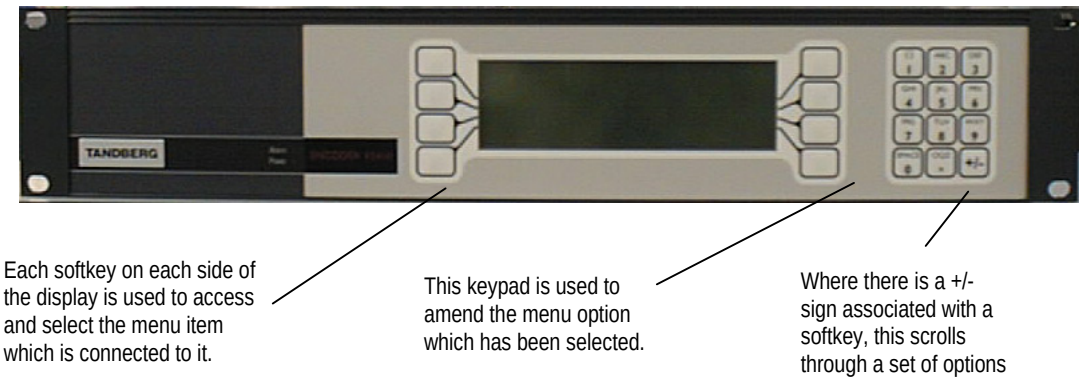


Figure 4.1: Keypad and Display Functions

4.2.2 How to Use the Keypad

Each key on the keypad has more than one inscription. For each numbered key on the keypad, one press of the key makes the number appear on the display screen, two quick presses makes the first letter appear etc. All buttons are cyclic, displaying their assigned characters in sequence.

Table 4.1: Keypad Button Assignments

Keypad	Button	1 Press	2 Presses	3 Presses	4 Presses
	1	1	(	:	)
	2	2	A	B	C
	3	3	D	E	F
	4	4	G	H	I
	5	5	J	K	L
	6	6	M	N	6
	7	7	P	R	S
	8	8	T	U	V
	9	9	W	X	Y
	0	0	Space	0	Space
	.	.	O	Q	Z
	+	+	/	-	+

Figure 4.2 gives details of how to access the inscriptions.

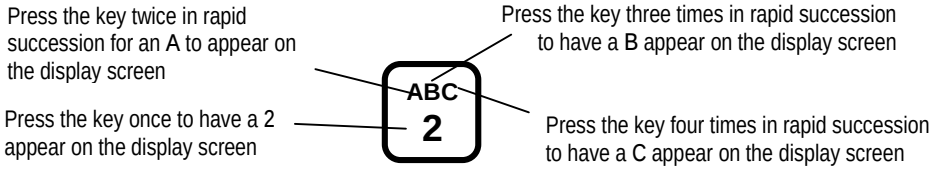
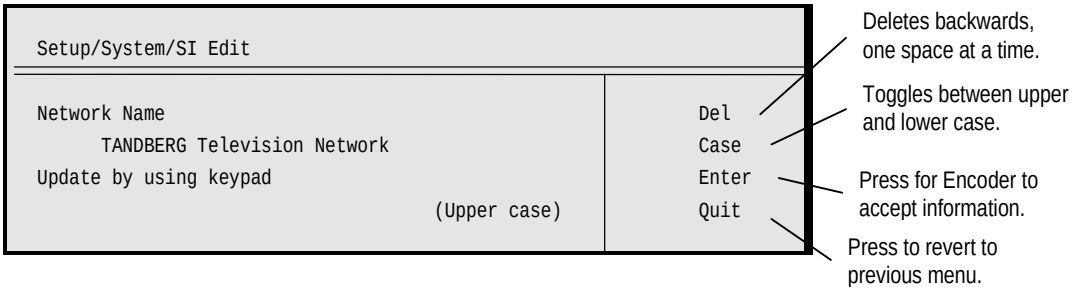


Figure 4.2: Accessing Inscriptions on the Keypad

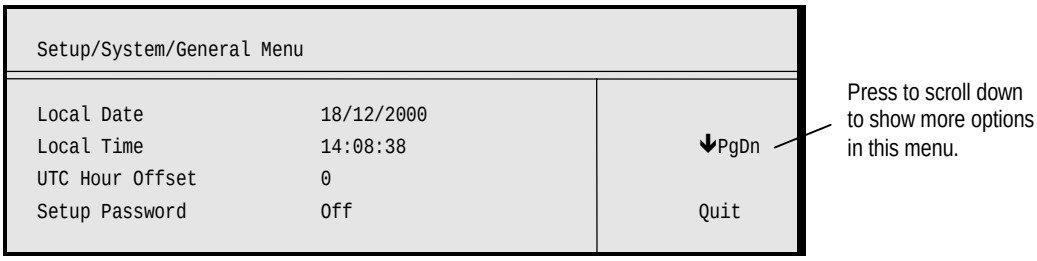
4.2.3 How to Use the Functions Associated with Softkeys

Option Functions

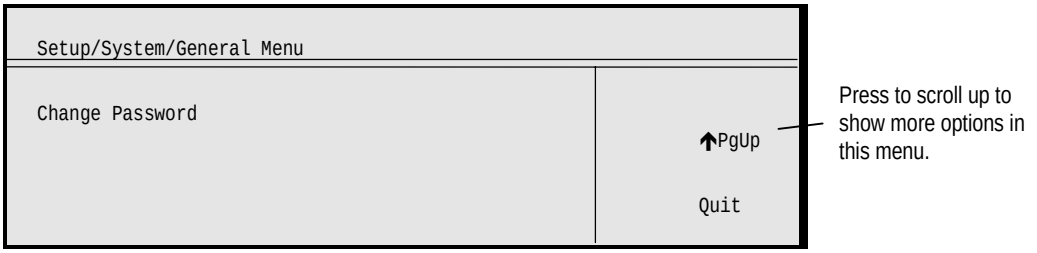
The following display screens show the use of the different functions associated with the options.



Scroll Down

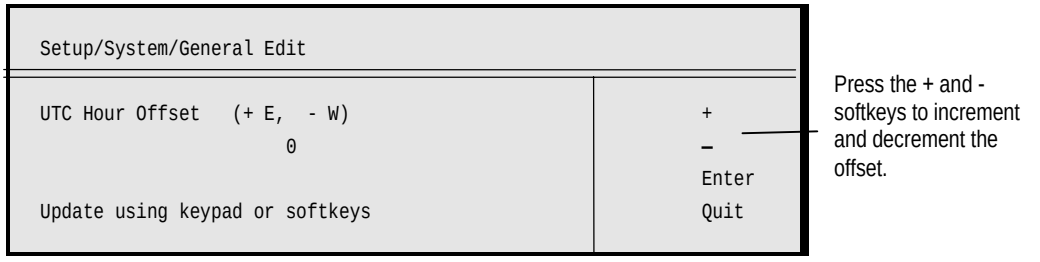


Scroll Up



+ and - Softkeys

The **+** and **-** softkeys have two functions, dependent upon which type of option they relate to.



4.2.4 Top Level Menu

Menu Hierarchy

The Top Level Menu provides options for configuring and testing the Encoder. Press the **Menu** softkey in the Summary Screen (see *Page 4-7*) to access the Top Level Menu.

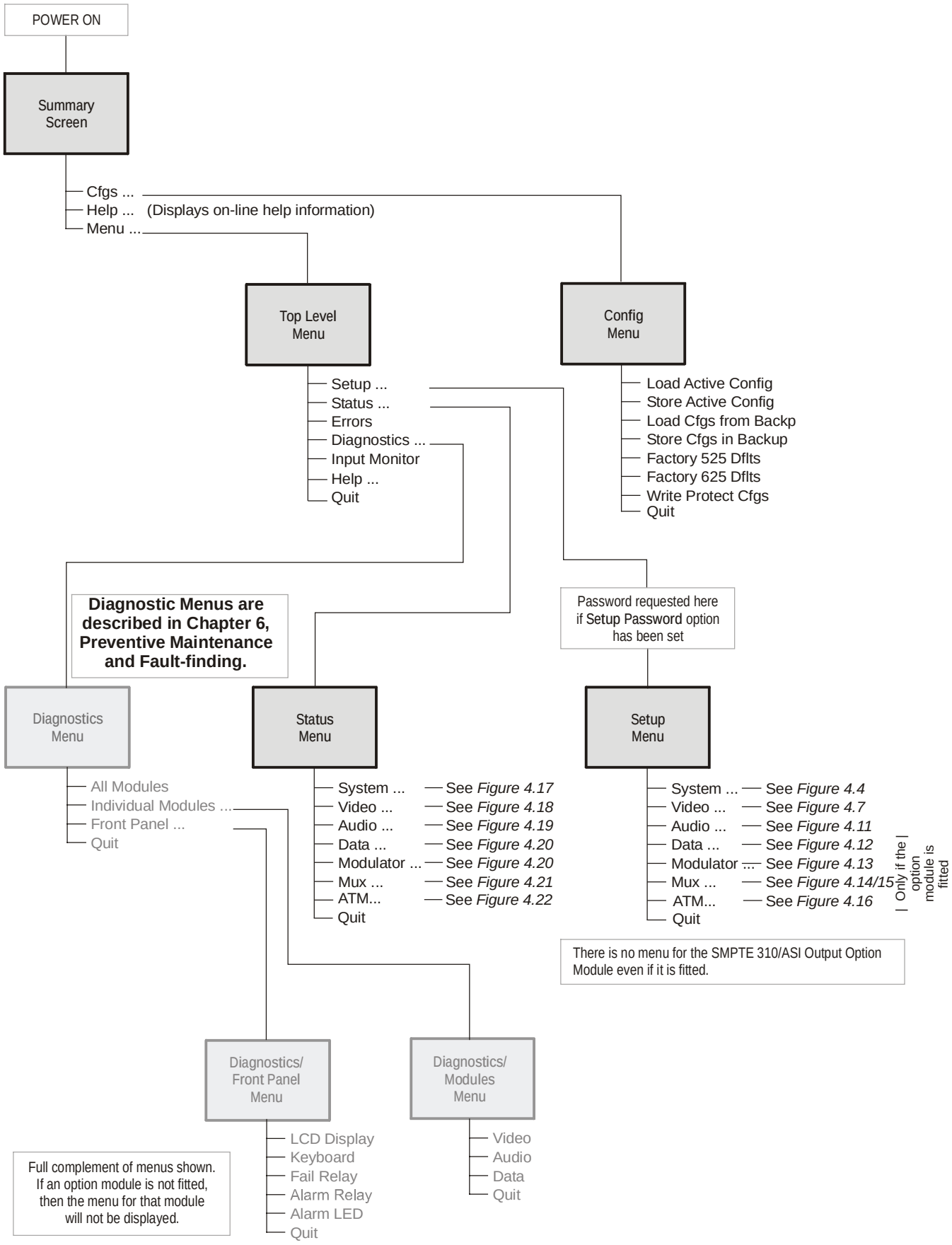


Figure 4.3: Menu Hierarchy – Summary Screen and Top Level Menu

Menu Formats

All menus generally conform to the format shown below.

Top Level Menu	
Setup	Input Monitor
Status	*
Errors	Help
Diagnostics	Quit

Each of the options on this top-level menu provides access to further sub-menus (dependent upon the option modules fitted). Some of the options in the sub-menus may differ from those shown in this manual. If a particular model of an Encoder does not support a feature then the options relating to that feature are not shown.

4.2.5 Setup Menu Options

The `Setup Menu` is selected from the `Top Level Menu` by pressing the **Setup** softkey. A password may be asked for if the password option has been set in the `System/General Menu` (see *Page 4-34*).

The menu options provide access to configuration and operating features.

Setup Menu	
System	Modulator
Video	Mux
Audio	ATM
Data	Quit

4.3 System Menu

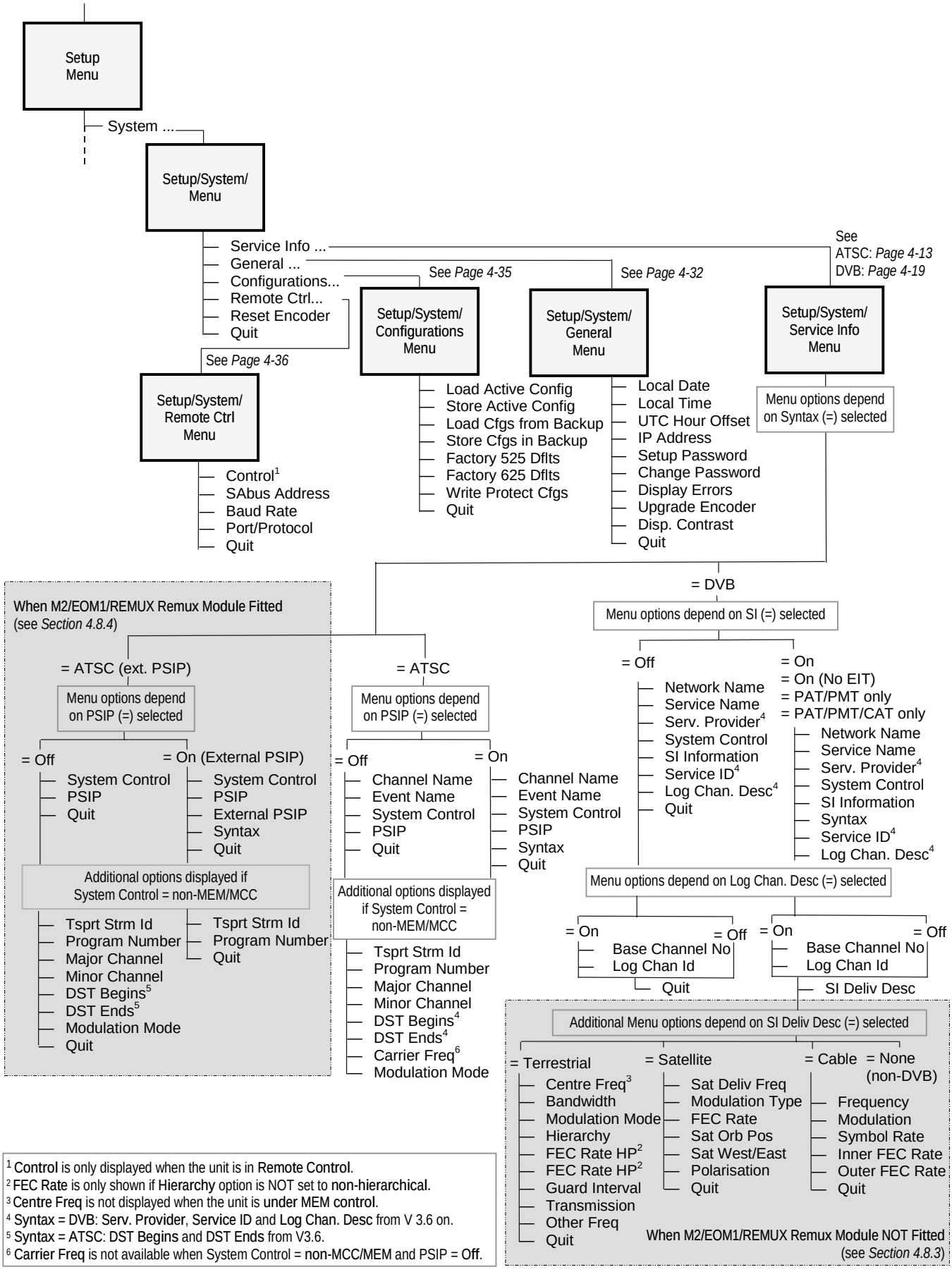
4.3.1 Introduction

The `System Menu` is selected from the `Setup Menu` by pressing the **System** softkey.

This menu permits the selection of system information and predefined configurations.

Setup/System Menu	
Service Info	Reset Encoder
General	*
Configurations	*
Remote Ctrl	Quit

> NOTE...
> The `Configurations` menu can also be accessed through the `Summary Screen` (see *page 4-7*).



[1] Control is only displayed when the unit is in Remote Control.
[2] FEC Rate is only shown if Hierarchy option is NOT set to non-hierarchical.
[3] Centre Freq is not displayed when the unit is under MEM control.
[4] Syntax = DVB: Serv. Provider, Service ID and Log Chan. Desc from V 3.6 on.
[5] Syntax = ATSC: DST Begins and DST Ends from V3.6.
[6] Carrier Freq is not available when System Control = non-MCC/MEM and PSIP = Off.

Figure 4.4: Menu Hierarchy – Setup/System Menu

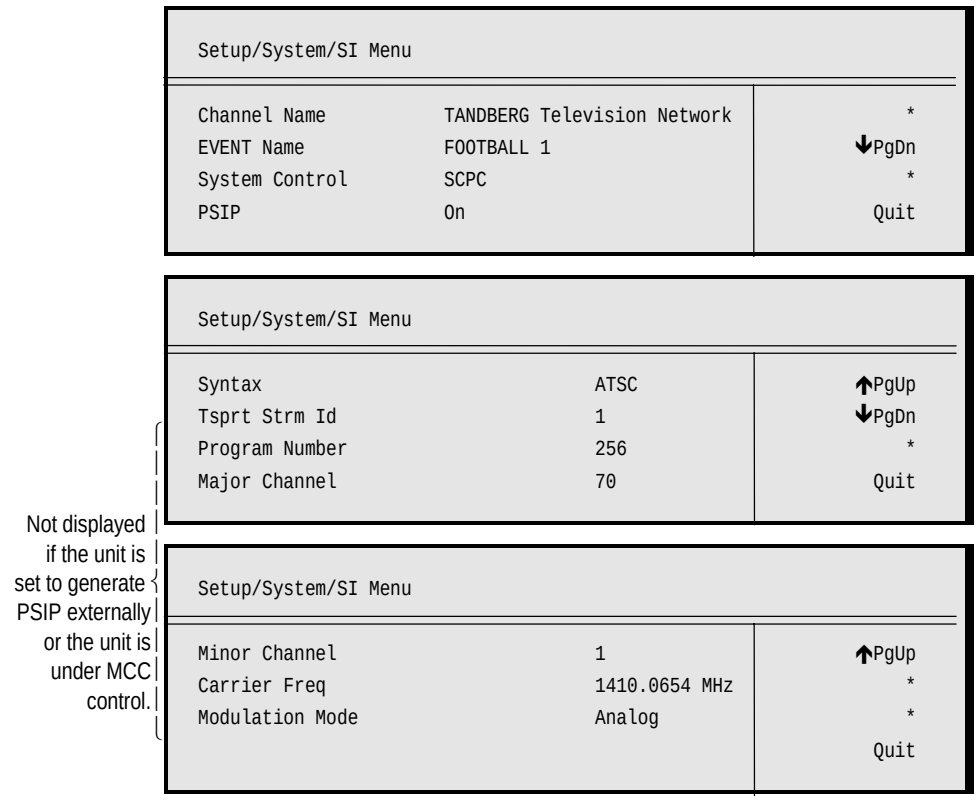
4.3.2 Service Info Menu (Syntax = ATSC)

Overview

The Service Info Menu is selected from the System Menu by pressing the **Service Info** softkey.

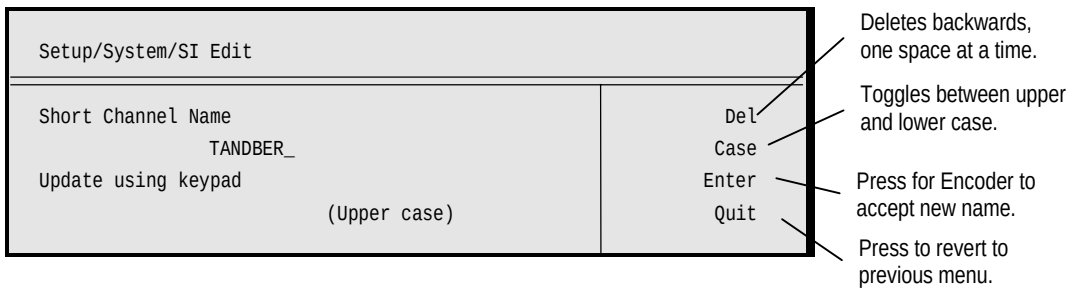
This menu provides options for configuring the Service Information (SI) parameters transmitted in the output transport stream and an option for switching inclusion of the SI in the transport stream on or off. The screens vary according to the SI delivery descriptor selected.

The following menus are shown if the Syntax option in the SI Menu has been set to **ATSC**.



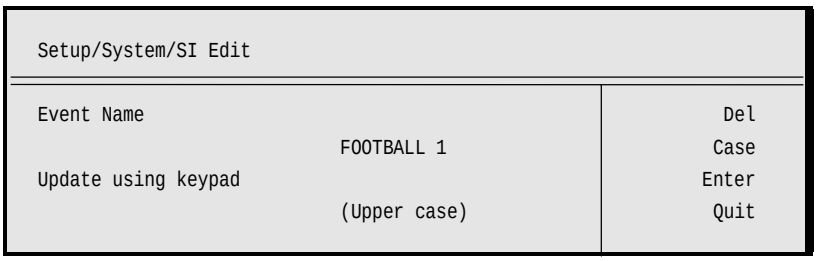
Channel Name Option

To access the Short Channel Name option, press the **Channel Name** softkey in the Service Info Menu. This option allows the Channel name to be changed.



Event Name Option

To access the Event Name option press the **Event Name** softkey in the Service Info Menu. This option allows the Event name to be changed.



System Control Option

To access the System Control option press the **System Control** softkey in the Service Info Menu. This option enables the type of system control specified in the SI to be set.

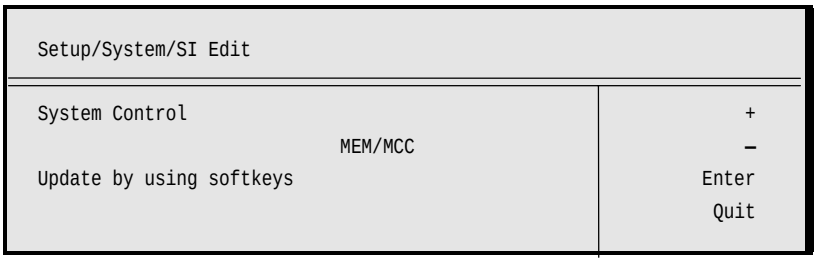


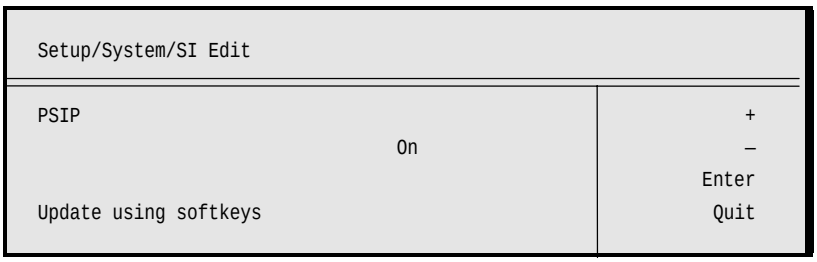
Table 4.2: System Control Options

Selected Option	Description
MEM/MCC	Control of the video/audio delay (lip sync) is via the MCC.
Non-MEM/MCC	Control of the video/audio delay (lip sync) is within the Encoder.

If the control equipment is a TT7000 System Manager, select the **MEM/MCC** option and then turn on the **Auto Lip Sync** from the Audio menu (see *page 4-74*). The TT7000 does not have a lip sync function therefore the Encoder has to provide this.

PSIP Option

To access the PSIP option, press the softkey in the Service Info Menu. This enables the inclusion of Program System Information Protocol (PSIP) in the output transport stream to be switched on or off. Use the **+** and **–** softkeys to alternate between On and Off and then press the **Enter** softkey after selecting one of them.



Syntax Option

To access the Syntax option, press the **Syntax** softkey in the `Service Info Menu`. This enables the syntax to be specified. Use the **+** and **–** softkeys to scroll through the options and then press the **Enter** softkey after selecting one of them.

```
Setup/System/SI Edit

Syntax                                          +
                                ATSC            –
                                              Enter
Update using softkeys                          Quit
```

NOTES...

1. The Syntax option is only displayed if PSIP (or SI) is NOT set to OFF.
2. The Syntax Option determines which set of System/Service Info menus are displayed.

Table 4.3: Syntax Options

Selected Option	Description	Comments
ATSC	Advanced Television Standards Committee.	
DVB	Digital Video Broadcasting.	See *page 4-19*

Tsprt Strm Id Option

To access the Tsprt Strm Id option, press the **Tsprt Strm Id** softkey in the `Service Info Menu`. This enables the Transport Stream Identity to be specified.

NOTE...

This option is not displayed if the unit is set to generate PSIP externally or it is under MCC control.

```
Setup/System/SI Edit

Transport Stream Id                             +
                                  1             –
                                              Enter
Update using keypad or softkeys                Quit
```

Table 4.4: Tsprt Strm Id Options

Selected Option		Description
Min:	0	Transport stream identity number.
Max:	65535	
Step Size:	1	

Program Number Option

To access the Program Number option, press the **Program Number** softkey in the `Service Info Menu`. This enables the Program Number to be specified.

> NOTE...
> This option is not displayed in the unit is set to generate PSIP externally or it is under MCC control.

```
Setup/System/SI Edit

Program Number                                    +
                              256                 –
                                                Enter
Update using keypad or softkeys                  Quit
```

Table 4.5: Program Number Options

Selected Option		Description
Min:	1	Program Number.
Max:	65535	
Step Size:	1	

Major Channel Option

To access the Major Channel[1] option, press the **Major Channel** softkey in the `Service Info Menu`. This option is associated with a field, *`major_channel_number`*, which is used for identification. It is used to group all channels that are to be identified as belonging to a particular broadcast corporation.

> NOTE...
> This option is not displayed in the unit is set to generate PSIP externally or it is under MCC control.

```
Setup/System/SI Edit

Major Channel                                     +
                              70                  –
                                                Enter
Update using keypad or softkeys                  Quit
```

Table 4.6: Major Channel Options

Selected Option		Description
Min:	1	Major Channel number.
Max:	99	
Step Size:	1	

[1] For further information refer to ATSC A-65 Program and System Information Protocol for Terrestrial Broadcast and Cable – Annex D.

Minor Channel Option

To access the Minor Channel option, press the **Minor Channel** softkey in the `Service Info Menu`. This option is associated with a field, *`minor_channel_number`*, which is used for identification. It specifies a particular channel within the *`major_channel_number`* group of channels.

> NOTE...
> This option is not displayed if the unit is set to generate PSIP externally or it is under MCC control.

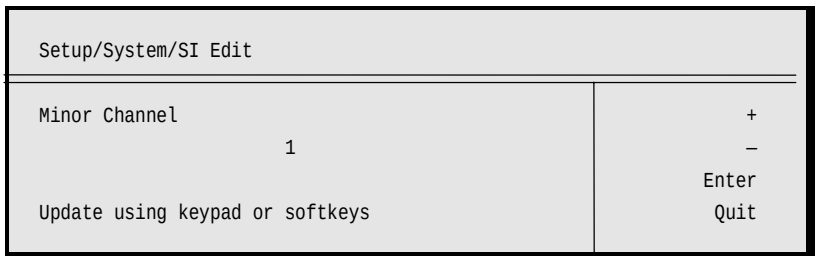


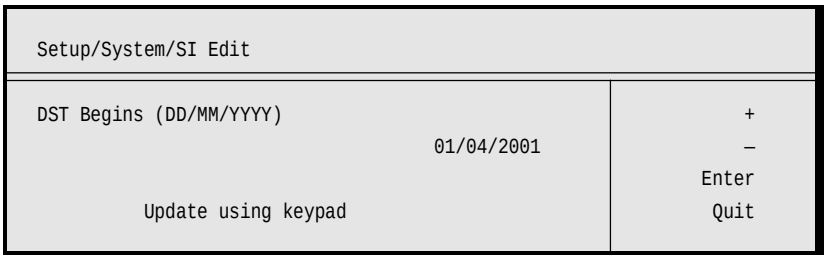
Table 4.7: Minor Channel Options

Selected Option		Description
Min:	1	Minor Channel number.
Max:	99	
Step Size:	1	

DST Begins (V3.6 on)

To access the Daylight Saving Time Begins option, press the **DST Begins** softkey in the `Service Info Menu`.

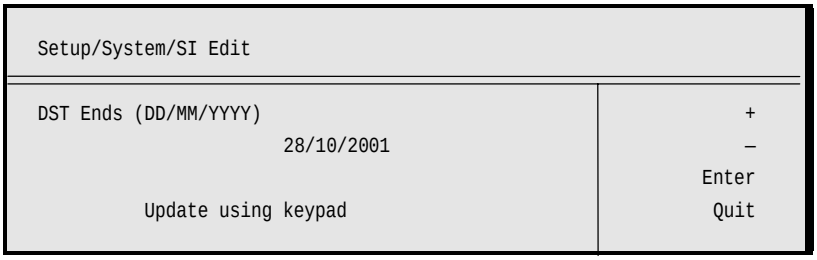
> NOTE...
> This option is displayed when System Control = non-MEM/MCC. In the case when the M2/EOM/REMUX option module is fitted, PSIP = Off has also to be selected.



DST Ends (V3.6 on)

To access the Daylight Saving Time Ends option, press the **DST Ends** softkey in the `Service Info Menu`.

> NOTE...
> See note under DST Begins for restrictions



Carrier Freq Option

To access the Carrier Freq option, press the **Carrier Freq** softkey in the Service Info Menu. This enables the carrier frequency of the transmitter to be specified. This is included in the PSIP Virtual Channel Table (VCT) if the Modulator output format is set to baseband (see the Output Format option on the Setup/Modulator Menu).

> NOTE...
> This option is not displayed in the unit is set to generate PSIP externally or it is under MCC control.

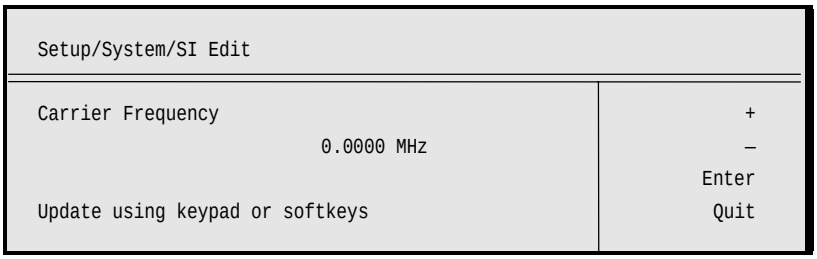


Table 4.8: Carrier Frequency Options

Selected Option	Description
Min: 0.0001 MHz Max: 42949.6729 MHz Step Size: 0.0001 MHz	Carrier frequency of transmitter.

Modulation Mode Option

To access the Modulation Mode option, press the **Modulation Mode** softkey in the Service Info Menu. This enables the type of modulation to be specified. This is included in the PSIP Virtual Channel Table (VCT) if the Modulator output format is set to baseband (see the Output Format option on the Setup/Modulator Menu).

If the Modulator output format is set to IF, then this option setting is ignored and the modulation type included in the NIT is that specified by the Modulation option on the Setup/Modulator Menu.

> NOTE...
> This option is not displayed if the unit is set to generate PSIP externally or it is under MCC control.

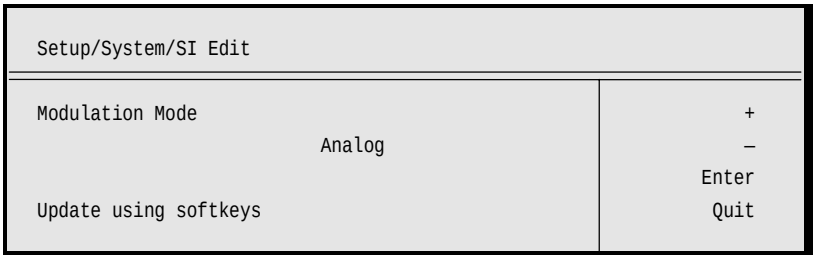


Table 4.9: Modulation Mode Options

Selected Option	Description
Analog	Analog modulation mode.
SCTE[2] Mode 1	SCTE Mode 1 modulation mode.
SCTE Mode 2	SCTE Mode 2 modulation mode.
ATSC (8 VSB)	ATSC (8 VSB) modulation mode.

4.3.3 Service Info Menu (Syntax = DVB)

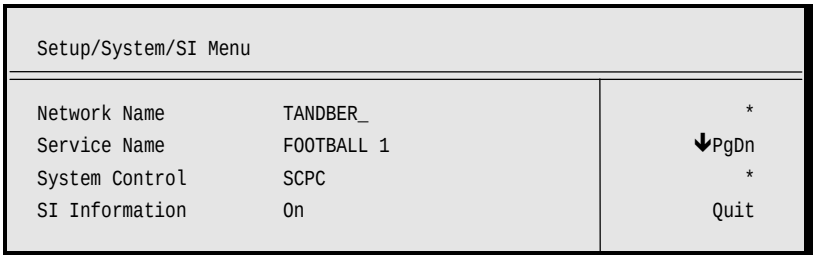
Overview

The Service Info Menu is selected from the System Menu by pressing the **Service Info** softkey.

This menu provides options for configuring the Service Information (SI) parameters transmitted in the output transport stream and an option for switching inclusion of the SI in the transport stream on or off. The screens vary according to the SI delivery descriptor selected.

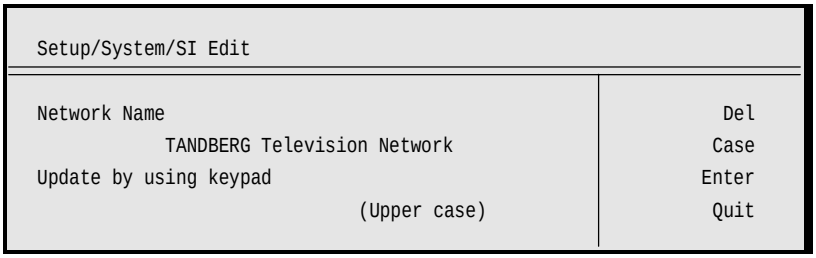
SI Menu

The following screen is shown irrespective of the transport stream delivery system.



Network Name Option

To access the Network Name option, press the **Network Name** softkey in the Service Info Menu. This option allows the network name to be changed.



[2] Society of Cable Television Engineers.

Service Name Option

To access the Service Name option press the **Service Name** softkey in the `Service Info Menu`. This option allows the service name to be changed.

```
Setup/System/SI Edit

Service Name                                    Del
                            Default Service     Case
Update by using keypad                          Enter
                            (Upper case)        Quit
```

Serv. Provider (V3.6 on)

To access the Service Provider option, press the **Serv. Provider** softkey in the `Service Info Menu`.

```
Setup/System/SI Edit

Service Provider                                Del
Default Provider_                               Case
Update by using keypad                          Enter
                            (Upper case)        Quit
```

System Control Option

See *System Control Option, page 4-14*.

SI Information Option

To access the SI Information option, press the **SI Information** softkey in the `Service Info Menu`. This enables the inclusion of DVB Service Information in the output transport stream to be switched on or off. Use the **+** and **–** softkeys to alternate between On and Off and then press the **Enter** softkey after selecting one of them.

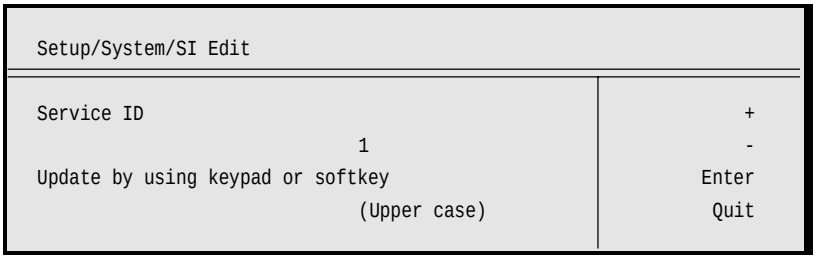
```
Setup/System/SI Edit

SI Information                                  +
                            On                  –
                                                Enter
Update using softkeys                           Quit
```

Syntax Option

See *Syntax Option, page 4-15*.

Service ID (V3.6 on)

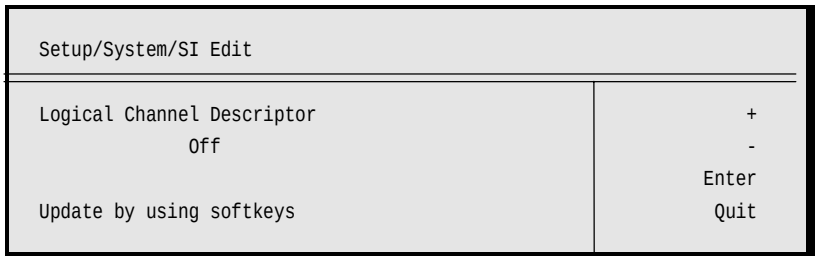
To access the Service ID option, press the **Service ID** softkey in the `Service Info Menu`.



Log Chan. Desc (V3.6 on)

Logical Channel descriptor Display

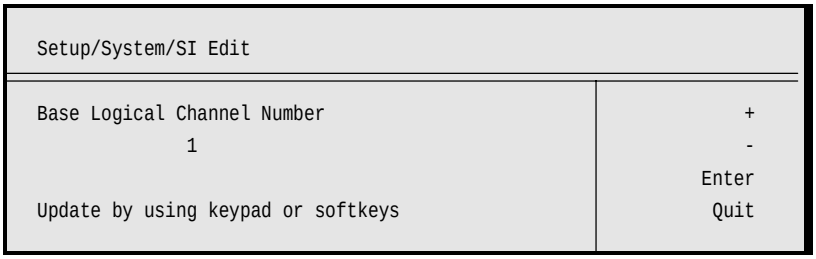
To access the Logical Channel Descriptor option, press the **Log Chan. Desc** softkey in the `Service Info Menu`.



Base Channel No

To access the Base Logical Channel Number option, press the **Base Channel No** softkey in the `Service Info Menu`.

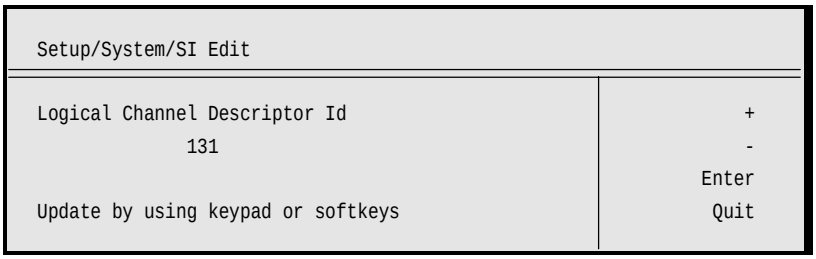
> NOTE...
> The Base Channel No option is only available when Log Chan. Desc = On.



Log Chan Id

To access the Logical Channel Descriptor Id option, press the **Logical Channel ID** softkey in the `Service Info Menu`.

> NOTE...
> The Log Chan Id option is only available when Log Chan. Desc = On.



SI Deliv Desc Option

To access the SI Deliv Desc option, press the **SI Deliv Desc** softkey in the Service Info Menu. This enables the SI delivery descriptor to be specified.

```
Setup/System/SI Edit

SI Delivery Descriptor                          +
                              Satellite         –
                                              Enter
Update using softkeys                          Quit
```

Table 4.10: SI Deliv Desc Options

Selected Option	Description	Comments
Satellite	SI delivery descriptor set to 'Satellite'.	The type of delivery descriptor selected affects the remaining options shown on the SI Menu.
Terrestrial	SI delivery descriptor set to 'Terrestrial'.	
None (non-DVB)	This setting is only available if the Output Format option on the Setup/ Modulator Menu is set to Baseband (188).	
Cable	SI delivery descriptor set to 'Cable'.	

In addition to the common information screens (see *Page 4-19)*, delivery-system specific information is also provided. These screens are shown in the following illustrations.

Satellite Systems

Top Level Menus

The SI Delivery Descriptor option is not available if the Encoder is connected to a TANDBERG Television Modulator in 204 byte mode.

```
Setup/System/SI Menu

Syntax                 DVB                  ↓PgDn
SI Deliv Desc          Satellite            ↓PgDn
Sat Deliv Freq         0.0000 GHz             *
Modulation Type        QPSK                 Quit
```

Deletes backwards, one space at a time.

Toggles between upper and lower case.

Press for Encoder to accept new name. Press to revert to previous menu.

```
Setup/System/SI Menu

FEC Rate               5/6                  ↑PgUp
Sat Orb Pos            1.5°                 ↓PgDn
Sat West/East          West                   *
Polarisation           Linear Horizontal    Quit
```

Satellite - Sat Deliv Freq Option

To access the Sat Deliv Freq option, press the **Sat Deliv Freq** softkey in the Service Info Menu. This enables the receive frequency of the satellite transponder to be specified. This is included in the SI Network Information Table (NIT) if the Modulator output format is set to baseband (see the Output Format option on the Setup/Modulator Menu).

If the Modulator output format is set to IF, then this option setting is ignored and the satellite delivery frequency included in the NIT is that specified by the Sat Del Freq option on the Setup/Modulator Menu.

```
Setup/System/SI Edit

Satellite Delivery Frequency                    +
          3525.1635 GHz                         –
                                              Enter
Update using keypad or softkeys               Quit
```

Table 4.11: Satellite Delivery Frequency Options

Selected Option	Description
Min: 0.0000 GHz Max: 999.9999 GHz Step Size: 0.0001 GHz	Receive frequency of satellite transponder.

Satellite – Modulation Type Option

To access the Modulation Type option, press the **Modulation Type** softkey in the Service Info Menu. This enables the type of modulation used by the satellite transponder to be specified. This is included in the SI NIT if the Modulator output format is set to baseband (see the Output Format option on the Setup/Modulator Menu).

If the Modulator output format is set to IF, then this option setting is ignored and the modulation type included in the NIT is that specified by the Modulation option on the Setup/Modulator Menu.

> NOTE...
> If the Encoder is connected to a TANDBERG Television Modulator in 204 byte mode the modulation type automatically defaults to QPSK. There is no option to change it.

```
Setup/System/SI Edit

Modulation Type                                 +
                      QPSK                      –
                                              Enter
Update using softkeys                         Quit
```

Table 4.12: Modulation Type Options

Selected Option	Description
BPSK	Satellite transponder uses BPSK modulation.
QPSK	Satellite transponder uses QPSK modulation.
8PSK	Satellite transponder uses 8PSK modulation.
16QAM	Satellite transponder uses 16QAM modulation.

Satellite – FEC Rate Option

To access the FEC Rate option, press the **FEC Rate** softkey in the Service Info Menu. This enables the FEC rate used by the satellite transponder to be specified. This is included in the SI NIT if the Modulator output format is set to baseband (see the Output Format option on the Setup/Modulator Menu).

If the Modulator output format is set to IF, then this option setting is ignored and the FEC rate included in the NIT is that specified by the FEC Rate option on the Setup/Modulator Menu.

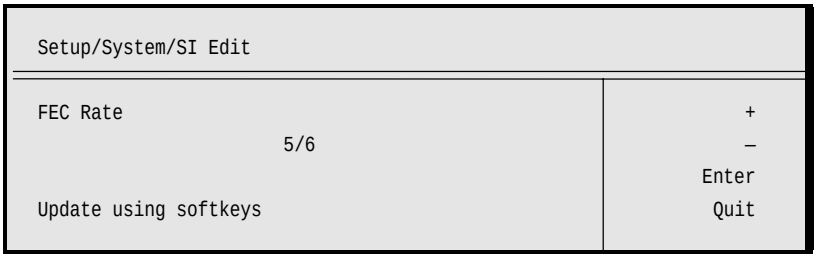


Table 4.13: FEC Rate Options

Selected Option	Description
None	Satellite transponder does not use FEC rate.
1/1	Satellite transponder uses FEC rate of 1/1.
1/2	Satellite transponder uses FEC rate of 1/2.
2/3	Satellite transponder uses FEC rate of 2/3.
3/4	Satellite transponder uses FEC rate of 3/4.
5/6	Satellite transponder uses FEC rate of 5/6.
7/8	Satellite transponder uses FEC rate of 7/8.
8/9	Satellite transponder uses FEC rate of 8/9.

Satellite – Sat Orb Pos Option

To access the Sat Orb Pos option, press the **Sat Orb Pos** softkey in the Service Info Menu. This enables the orbital position of the satellite to be specified. This is included in the SI NIT if the Modulator output format is set to baseband (see the Output Format option on the Setup/Modulator Menu).

If the Modulator output format is set to IF, then this option setting is ignored and the satellite orbital position included in the NIT is that specified by the Sat Orb Pos option on the Setup/Modulator Menu.

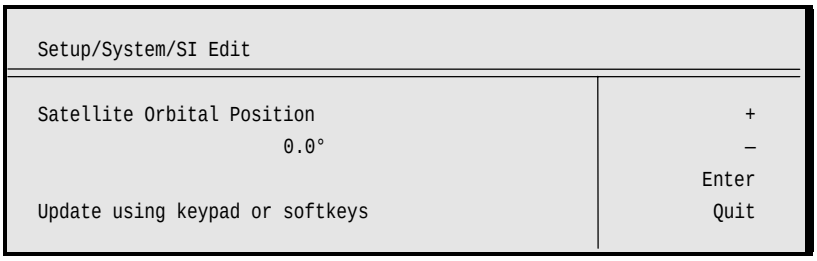


Table 4.14: Satellite Orbital Position Options

Selected Option	Description
Min: 0.0° Max: 360.0° Step Size: 0.1°	Orbital position of satellite.

Satellite – Sat West/East Option

To access the Sat West/East option, press the **Sat West/East** softkey in the `Service Info Menu`. This enables the satellite west/east flag to be specified to indicate whether the satellite position is in the western or eastern part of the orbit. This is included in the SI NIT if the Modulator output format is set to baseband (see the Output Format option on the `Setup/Modulator Menu`).

If the Modulator output format is set to IF, then this option setting is ignored and the sat west/east flag included in the NIT is that specified by the Sat West/East option on the `Setup/Modulator Menu`.

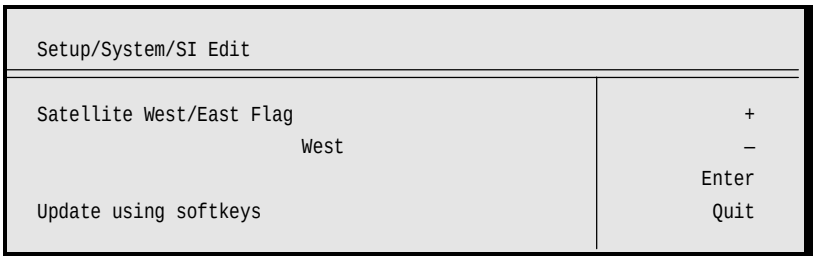


Table 4.15: Satellite West/East Options

Selected Option	Description
West	Satellite position is in western part of the orbit.
East	Satellite position is in the eastern part of the orbit.

Satellite – Polarisation Option

To access the Polarisation option, press the **Polarisation** softkey in the `Service Info Menu`. This enables the polarisation of the satellite transponder to be specified. This is included in the SI NIT if the Modulator output format is set to baseband (see the Output Format option on the Setup/Modulator Menu).

If the Modulator output format is set to IF, then this option setting is ignored and the polarisation setting included in the NIT is that specified by the Polarisation option on the `Setup/Modulator Menu`.

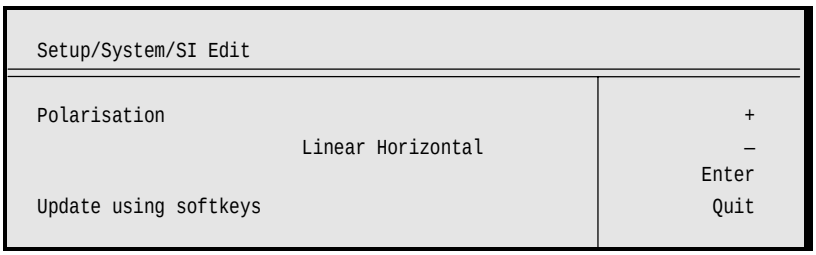
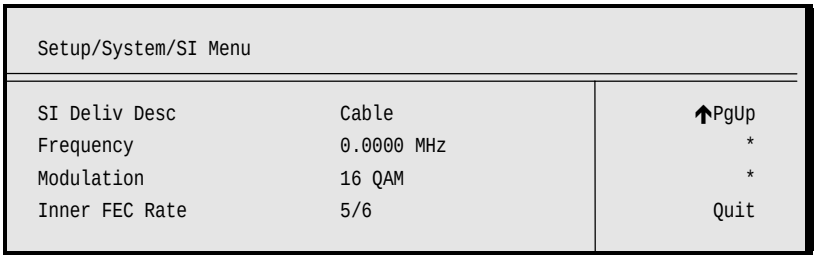


Table 4.16: Polarisation Options

Selected Option	Description
Linear Horizontal	Satellite transponder uses linear horizontal polarisation.
Linear Vertical	Satellite transponder uses linear vertical polarisation.
Circular Left	Satellite transponder uses circular left polarisation.
Circular Right	Satellite transponder uses circular right polarisation.

Cable Systems

Top Level Menu



Cable – Frequency Option

To access the Frequency option, press the **Frequency** softkey in the `Service Info Menu`. This screen enables the frequency of the cable channel to be specified. This is included in the SI NIT if the Modulator output format is set to baseband (see the Output Format option on the `Setup/Modulator Menu`).

Table 4.17: Frequency Options

Selected Option	Description
Min: 0.0000 MHz Max: 9999.9999 MHz Step Size: 0.0001 MHz	Frequency of cable channel.

Cable – Modulation Option

To access the Modulation option, press the **Modulation** softkey in the Service Info Menu. This screen enables the type of modulation used by the cable channel to be specified. This is included in the SI NIT if the Modulator output format is set to baseband (see the Output Format option on the Setup/Modulator Menu).

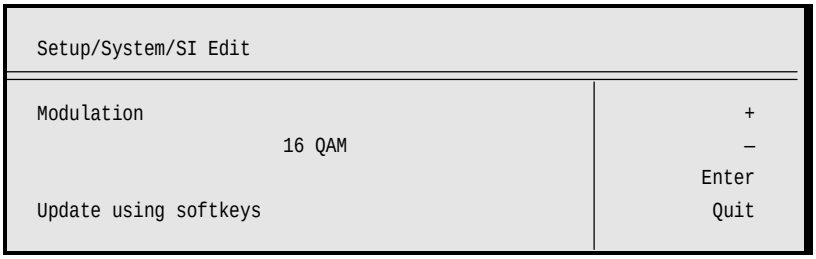


Table 4.18: Modulation Options

Selected Option	Description
Not Defined	Modulation of cable channel is not defined.
16 QAM	Cable channel uses 16 QAM modulation.
32 QAM	Cable channel uses 32 QAM modulation.
64 QAM	Cable channel uses 64 QAM modulation.
128 QAM	Cable channel uses 128 QAM modulation.
256 QAM	Cable channel uses 256 QAM modulation.

Cable – Inner FEC Rate Option

To access the Inner FEC Rate option, press the **Inner FEC Rate** softkey in the Service Info Menu. This screen enables the inner FEC rate used by the cable channel to be specified. This is included in the SI NIT if the Modulator output format is set to baseband (see the Output Format option on the Setup/Modulator Menu).

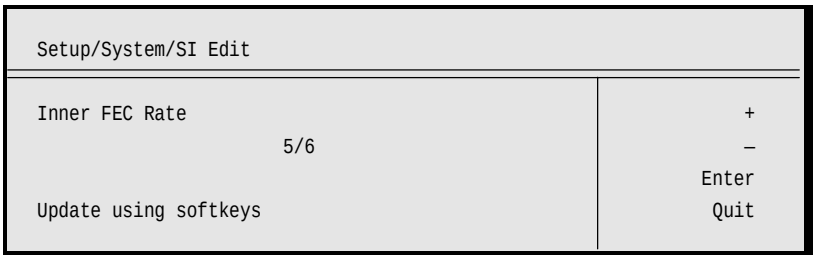


Table 4.19: Inner FEC Rate Options

Selected Option	Description
None	Cable channel does not use inner FEC rate.
1/2	Cable channel uses inner FEC rate of 1/2.
2/3	Cable channel uses inner FEC rate of 2/3.
3/4	Cable channel uses inner FEC rate of 3/4.
5/6	Cable channel uses inner FEC rate of 5/6.
7/8	Cable channel uses inner FEC rate of 7/8.

Terrestrial Systems

Top Level Menus

Centre Frequency is not displayed if the unit is under MCC control

```
Setup/System/SI Menu

SI Deliv Desc              Terrestrial          ↑PgUp
Centre Frequency           0.0000 MHz           ↓PgDn
Bandwidth                  8 MHz                  *
Modulation Mode            QPSK                 Quit
```

FEC Rate options are only shown if the Hierarchy option is NOT set to Non-Hierarchical

```
Setup/System/SI Menu

Hierarchy                  Alpha=1              ↑PgUp
FEC Rate HP                1/2                  ↓PgDn
FEC Rate LP                1/2                    *
Guard Interval             1/32                 Quit
```

```
Setup/System/SI Menu

Transmission                        2k Mode     ↑PgUp
Other Freq                          In Use        *
                                                  *
                                                Quit
```

Terrestrial – Centre Freq Option

See *Carrier Freq Option, page 4-17*.

Terrestrial – Bandwidth Option

To access the Bandwidth option, press the **Bandwidth** softkey in the `Service Info Menu`. This enables the channel spacing of the terrestrial transmitter to be specified. This is included in the SI NIT if the Modulator output format is set to baseband (see the Output Format option on the `Setup/Modulator Menu`).

```
Setup/System/SI Edit

Bandwidth                                          +
                        8 MHz                      –
                                                 Enter
Update using softkeys                            Quit
```

Table 4.20: Bandwidth Options

Selected Option	Description
6 MHz	Terrestrial transmitter channel spacing is 6 MHz.
7 MHz	Terrestrial transmitter channel spacing is 7 MHz.
8 MHz	Terrestrial transmitter channel spacing is 8 MHz.

Terrestrial – Modulation Mode Option

To access the Modulation Mode option, press the **Modulation Mode** softkey in the `Service Info Menu`. This enables the modulation mode used by the terrestrial transmitter to be specified. This is included in the SI NIT if the Modulator output format is set to baseband (see the Output Format option on the `Setup/Modulator Menu`).

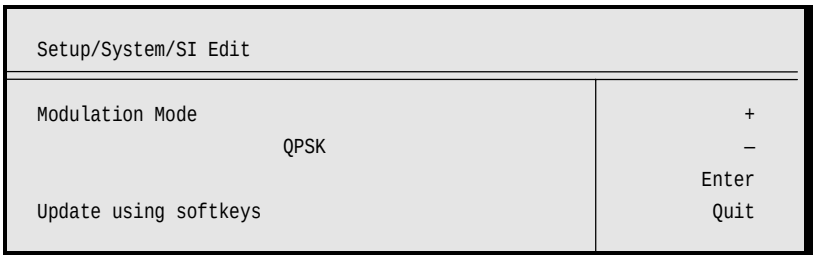


Table 4.21: Modulation Mode Options

Selected Option	Description
QPSK	Terrestrial transmitter uses QPSK modulation mode.
16-QAM	Terrestrial transmitter uses 16-QAM modulation mode.
64-QAM	Terrestrial transmitter uses 64-QAM modulation mode.

Terrestrial – Hierarchy Option

To access the Hierarchy option, press the **Hierarchy** softkey in the `Service Info Menu`. This screen enables the hierarchy of the terrestrial transmission to be specified. This is included in the SI NIT if the Modulator output format is set to baseband (see the Output Format option on the `Setup/Modulator Menu`).

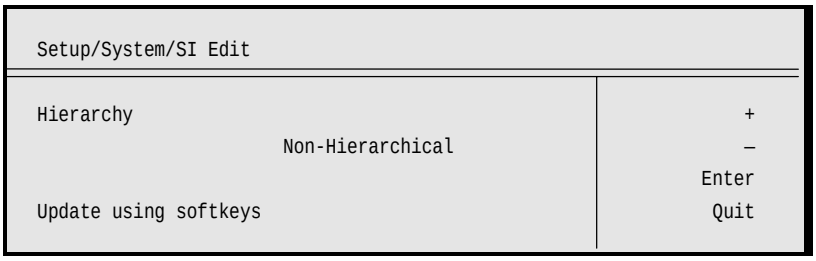


Table 4.22: Hierarchy Options

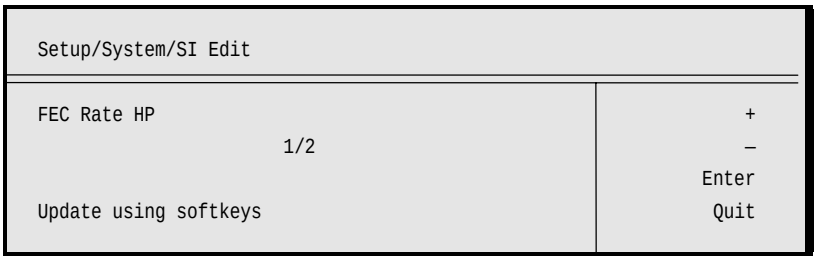
Selected Option	Description
Non-Hierarchical	Terrestrial transmission is not hierarchical.
Alpha=1	Terrestrial transmission is hierarchical, and the α value = 1.
Alpha=2	Terrestrial transmission is hierarchical, and the α value = 2.
Alpha=4	Terrestrial transmission is hierarchical, and the α value = 4.

Terrestrial – FEC Rate HP and FEC Rate LP Options

To access the FEC Rate HP or the FEC Rate LP option, press the **FEC Rate HP** or **FEC Rate LP** softkey in the `Service Info Menu`. These screens enable the inner FEC schemes used by the terrestrial transmitter to be specified. These are included in the SI NIT if the Modulator output format is set to baseband (see the Output Format option on the `Setup/Modulator Menu`).

> NOTE...
> If the Hierarchy option is set to Non-Hierarchical, then only the FEC Rate parameter is used and shown on the display.

If the **Hierarchy** option is set to **Alpha=*n***, then the **FEC Rate HP** and **FEC Rate LP** parameters provide two levels of modulation. Transmission starts with the code rate for the HP level of modulation and ends with the code rate for the LP level.



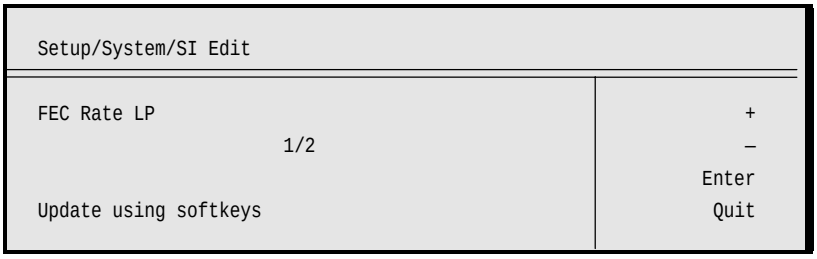


Table 4.23: FEC Rate HP and LP Options

Selected Option	Description
1/2	Terrestrial transmitter FEC rate HP/LP is 1/2.
2/3	Terrestrial transmitter FEC rate HP/LP is 2/3.
3/4	Terrestrial transmitter FEC rate HP/LP is 3/4.
5/6	Terrestrial transmitter FEC rate HP/LP is 5/6.
7/8	Terrestrial transmitter FEC rate HP/LP is 7/8.

Terrestrial – Guard Interval Options

To access the Guard Interval option, press the **Guard Interval** softkey in the `Service Info Menu`. This enables the guard interval of the terrestrial transmitter to be specified. This is included in the SI NIT if the Modulator output format is set to baseband (see the Output Format option on the `Setup/Modulator Menu`).

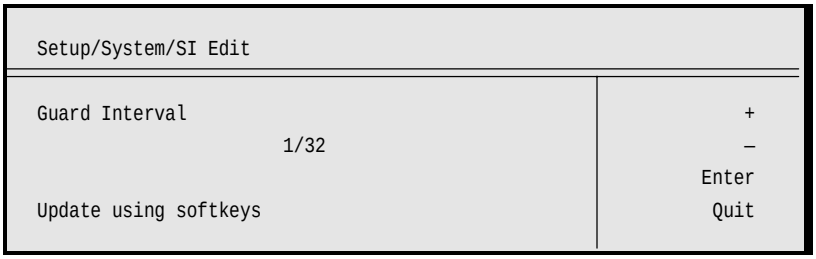


Table 4.24: Guard Interval Options

Selected Option	Description
1/4	Terrestrial transmitter guard interval is 1/4.
1/8	Terrestrial transmitter guard interval is 1/8.
1/16	Terrestrial transmitter guard interval is 1/16.
1/32	Terrestrial transmitter guard interval is 1/32.

Terrestrial – Transmission Options

To access the Transmission option, press the **Transmission** softkey in the Service Info Menu. This enables the transmission mode (i.e. number of carriers in an OFDM frame) used by the terrestrial transmitter to be specified.

This is included in the SI NIT if the Modulator output format is set to baseband (see the Output Format option on the Setup/Modulator Menu).

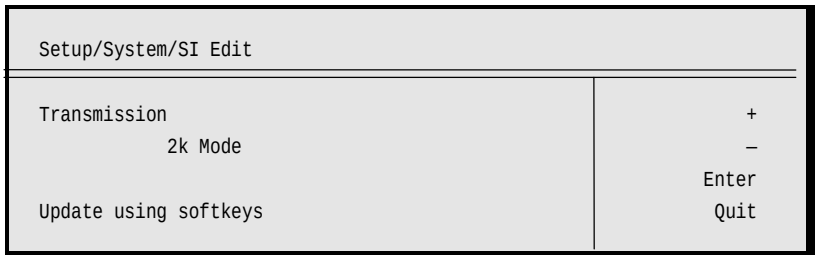


Table 4.25: Transmission Options

Selected Option	Description
2k Mode	Terrestrial transmitter uses 2k transmission mode (2k carriers in an OFDM frame).
8k Mode	Terrestrial transmitter uses 8k transmission mode (8k carriers in an OFDM frame).

Terrestrial – Other Freq Options

To access the Other Freq option, press the **Other Freq** softkey in the Service Info Menu. This enables the flag which specifies whether other frequencies are in use or not to be set. This is included in the SI NIT if the Modulator output format is set to baseband (see the Output Format option on the Setup/Modulator Menu).

```
Setup/System/SI Edit
-------------------------------------------------
Other Frequency                            |     +
              In Use                       |     –
                                           | Enter
Update using softkeys                      |  Quit
```

Table 4.26: Other Frequency Options

Selected Option	Description
None	No other frequency is in use.
In Use	One or more other frequencies are in use.

4.3.4 General Menu

Overview

The General Menu is selected from the System Menu by pressing the General softkey. This menu provides options for amending the time, date and password.

```
Setup/System/General Menu
-------------------------------------------------
Local Date          14/09/2000             |      *
Local Time          14:08:38               |  ↓PgDn
UTC Hour Offset     0 Hours                |      *
IP Address          172.16.248.91          |   Quit
```

Press this softkey to show more options in this menu.

```
Setup/System/General Menu
-------------------------------------------------
Setup Password      Off                    |  ↑PgUp
Change Password                            |      *
Display Errors      Off                    |      *
Upgrade Encoder                            |   Quit
```

Press this softkey to revert to previous display screen.

Local Date Option

To access the Local Date option, press the **Local Date** softkey in the General Menu.

```
Setup/System/General Edit
-------------------------------------------------
Current Date                               |   Del
               14/09/2000                  |
                                           | Enter
Update using keypad                        |  Quit
```

Local Time Option

To access the Local Time option, press the **Local Time** softkey in the General Menu.

```
Setup/System/General Edit

Current Time                                        Del
                        14:08:38
                                                  Enter
Update using keypad                                Quit
```

UTC Hour Offset Option

The Universal Time Co-ordinate (UTC) is effectively the same as Greenwich Mean Time (GMT). When including SI in the output transport stream the Encoder is required to output a Time and Date Table (TDT). This uses UTC. Therefore, as the local time is input on the front panel a UTC offset is needed so that the UTC time for the TDT table is generated.

To access the UTC Hour Offset option, press the **UTC Hour Offset** softkey in the General Menu.

```
Setup/System/General Edit

UTC Hour Offset   (+ E,  - W)                        +
                       0 Hours                       –
                                                  Enter
Update using keypad or softkeys                    Quit
```

Press the + and - softkeys to increment and decrement the offset.

Table 4.27: UTC Hour Offset Options

Selected Option	Description
Min: –12 Hours Max: 12 Hours Step Size: 1 Hour	UTC hour offset. A positive value indicates East of Greenwich, and a negative value indicates West of Greenwich.

If the specified UTC offset is outside the valid input range, a confirmation screen is displayed which shows the maximum/minimum value allowed.

```
Confirmation Screen

UTC Hour Offset   (+ E,  - W)
Specified Value Too High
Select <Enter> to Set to                           Enter
Maximum :  14 Hour                                 Quit
```

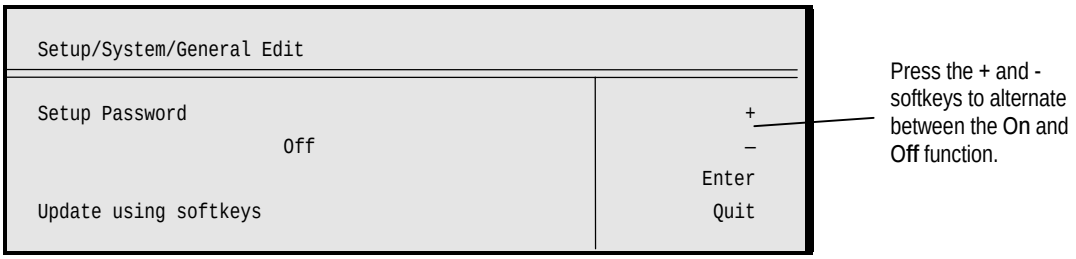
IP Address Option

To access the IP Address option, press the **IP Address** softkey in the General Menu.

```
Setup/System/General Edit

IP Address                                          Del
                        172.16.248.91               Case
Update using keypad                                Enter
                        (Upper case)                Quit
```

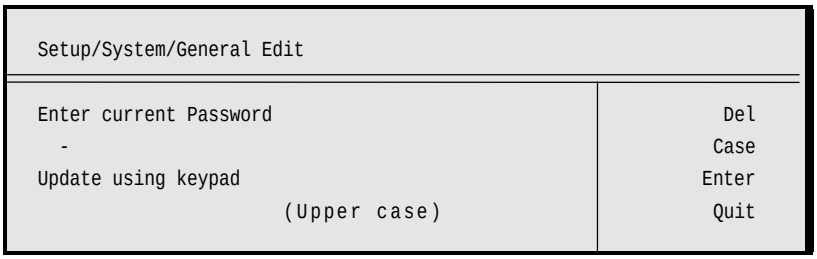
Setup Password Option

There is no password originally required to enter the Setup Menu so if one is needed then it must be set. To access the Setup Password option, press the **Setup Password** softkey in the General Menu. The password can be either on or off.



Change Password Option

To access the Change Password option, press the **Change Password** softkey in the General Menu. **The default password is 123456789**.



Display Errors Option

To access the Display Errors option, press the **Display Errors** softkey in the General Menu.

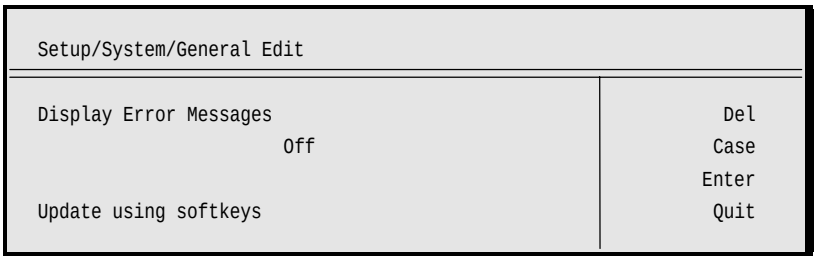


Table 4.28: Display Error Messages Options

Selected Option	Description
On	Any relevant error messages are displayed when booting or fleetingly during operation.
Off	Any relevant error messages are not displayed when booting.

Upgrade Encoder Option (V3.3 on)

There a number of features in V3.3 which are not enabled by default. These features are 4:2:2 (E5210), Dolby AC-3 (requires M2/EOM/AUD option module to be fitted) and ATM Signalling (SVCs). To enable these features, go to Setup>System>General>Upgrade Encoder. This presents you with a 4 digit number. Send this to TANDBERG Customer Services and they will return a 12 digit key which the user enters via the front panel to enable the feature.

Disp. Contrast Option (V3.3 On)

This option allows the contrast ratio of the LCD display to be set. The contrast range is: light, medium, medium dark, dark, very dark.

If the background is set to very dark, the text may not be visible. In this instance, view the display at an acute angle, this should enable the text to be seen enough to change the contrast.

4.3.5 Configurations Menu

Accessing the Menu

The `Configs Menu` can be selected from the `Summary Screen` by pressing the **Configurations** softkey.

Overview

The Encoder has a set of 16 default configurations for both 525 and 625 line standards. These configurations provide the basis for quick and easy configuration of the operating parameters for common set-ups, without having to enter all parameters individually. The default configurations can be used as they are, or loaded as the active configuration and edited as required.

The Encoder normally holds the following configurations:

- One Active Configuration (it runs the Encoder)
- Sixteen user configurations (in the User FLASH)
- Sixteen backup configurations (in Backup FLASH)
- Sixteen 525 factory default configurations
- Sixteen 625 factory default configurations

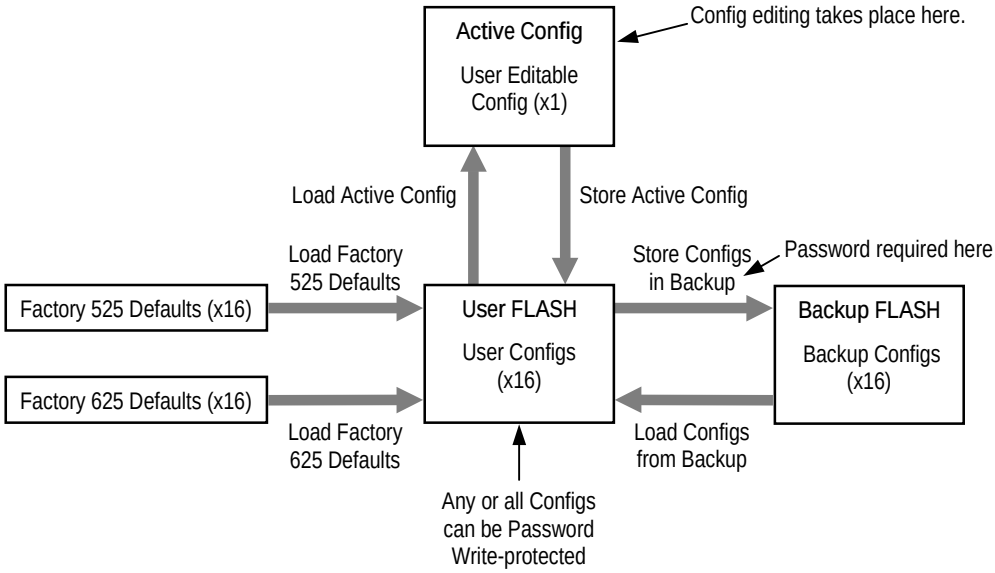


Figure 4.5: Configuration, Graphical Explanation

Active Configuration

This is the configuration that the Encoder is currently using. It is loaded from one of the 16 user configuration locations (**Load Active Config**). It can be edited at any time and also stored back as one of the user configurations (**Store Active Config**).

User Configurations

Configurations loaded into the user FLASH become user configurations. Any one of the user configurations can be loaded as an active configuration (**Load Active Config**). A modified active configuration can be copied back into one of the user FLASH locations (**Store Active Config**) where it can be password write-protected. A user configuration that is write-protected cannot be overwritten. The 16 user configurations can be saved in the backup FLASH (**Store Configs in Backup**).

> CAUTION...
>
> Any user configuration that is not write-protected, will be overwritten when Factory Default or Backup configurations are loaded to the user FLASH.

Backup Configurations

Selecting **Store Configs in Backup** Backup FLASH stores a copy of each of the 16 user configurations. You will be asked for the password here.

If unsure of the user configurations or they become inadvertently modified, the user configurations can be returned to a known state at any time by the command **Load Cfgs from Backup**. This loads the 16 backup configurations to the User FLASH, overwriting all user configurations that are not write-protected. Individual configurations cannot be selected for loading to the User FLASH.

The active (current) configuration is unaltered when you select **Load Cfgs from Backup**.

Factory Default Configurations

There are 16 default configurations for both 525 and 625 line standards. They are provided as examples and can be used as they are, if their settings suit your needs. They are non-editable. The 16 default configurations (525 or 625) can be loaded to the user FLASH at any time by selecting **Factory 525 (or 625) Defaults**. This will overwrite all user configurations that are not write-protected. Individual configurations cannot be selected for loading to the User FLASH.

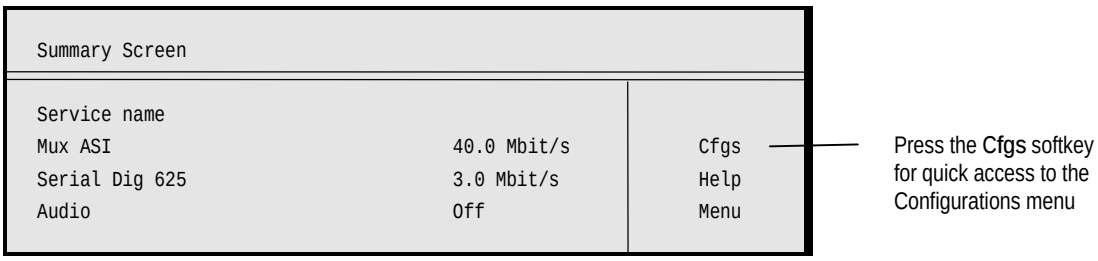
Configuration, Write-Protection

Any or all of the 16 user configurations can be write-protected by selecting **Write Protect Cfgs**. A password is asked for. With the correct password entered, the question **Write protect Which Cfgs?** appears.
Select which configurations to protect by pressing the associated softkey in each case. This toggles the write-protect condition (On or Off) for each individual configuration. The letter **R** when shown to the left of the config number, indicates that the configuration is read-only (write-protected).

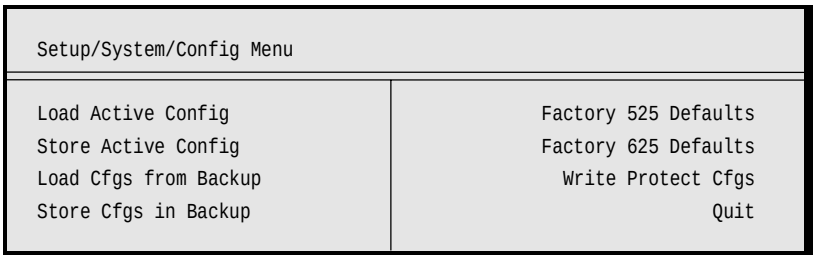
Any configuration that is write-protected will be displayed as read-only if attempting to overwrite it.

4.3.6 Quick Configuration From the Summary Screen

The sixteen predefined user configurations are a quick and easy way to configure the Encoder without having to enter individual parameters. The Config Menu can be accessed directly from the summary screen (see *page 4-7)* by pressing the **Cfgs** softkey. Press the **Load Active Cfg** softkey (see *Load Active Config Option* on *page 4-37*) and a list of configurations is shown (refer to *Annex C, Predefined User Configurations* for details of individual configurations).
Select the required one by pressing the associated softkey. Nothing more need be done. The Encoder is ready for use.

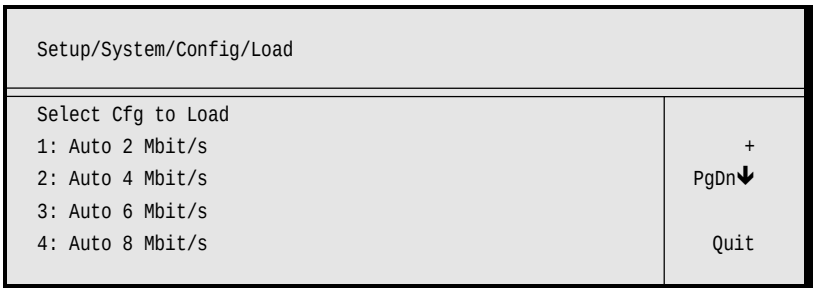


This menu provides options for loading and storing predefined configurations and updating and restoring backup configurations.



Load Active Config Option

To access the Load Active Config option, press the **Load Active Config** softkey in the Config Menu. Use the softkeys to select the required configuration to be loaded. See *Annex C, Predefined User Configurations* for details of predefined configurations.



Store Active Config Option

To access the Store Active Config option, press the **Store Active Config** softkey in the Config Menu. Use the softkeys to select the position where the configuration is to be stored.

> NOTE...
>
> There is no confirmation screen, the configuration is overwritten immediately the softkey indicating the storage position is selected.

Load Cfgs From Backup Option

This option enables the 16 user configurations to be overwritten with the 16 backup configurations. To update the backup configurations press the **Load Cfgs from Backup** softkey in the Config Menu.

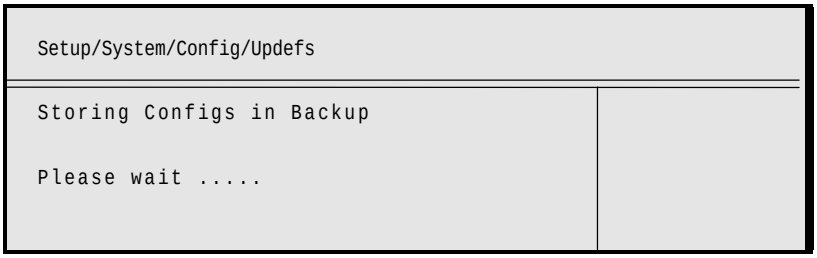
> NOTE...
> The 16 backup configurations are loaded immediately the Load Configs from Backup softkey is pressed although the current Encoder configuration remains unchanged.

Store Cfgs in Backup Option

This enables the 16 user configurations to be stored in the backup, and may be password protected. Press the **Store Cfgs in Backup** softkey in the Config Menu.

> NOTE...
> The 16 backup configurations are stored immediately the Store Cfgs in Backup softkey is pressed.

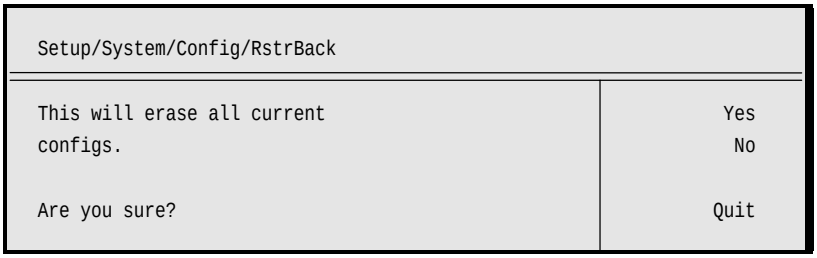
As the configurations are being saved to the backup (this takes only a second or two), the following screen is displayed.



Factory 525 Dflts Option

This screen enables the 16 user configurations to be overwritten by the factory default settings for 525 line/29.97 Hz video operation. Press the **Factory 525 Dflts** softkey in the Configurations Menu to display the Setup/System/Config/RstrBack screen.

Press the **Yes** softkey to restore the factory default settings, or the **No** softkey to return to the menu and keep the current configurations.



Factory 625 Dflts Option

The Factory 625 Dflts option is very similar to the Factory 525 Dflts option, except that it overwrites the 16 user configurations with the factory default settings for 625 line/25 Hz video operation. See the Factory 525 Dflts option for further details.

Write Protect Cfgs Option

This screen enables the user configurations to be write protected and not overwritten unless the correct password is entered. Press the **Write Protect Cfgs** softkey in the Configurations Menu to display the Setup/System/Config/Write Protect Cfgs screen. Enter the correct password.

```
Setup/System/Config/Write Protect

Enter password using keypad                          Del
                                                     Case
                                                     Enter
                        (Upper case)                 Quit
```

4.3.7 Remote Control Menu

Overview

Selected from the System Menu by pressing the **Remote Ctrl** softkey, this menu provides options for amending the remote control options.

This option is only shown if the Encoder is already in Remote control, to allow it to be set to Local control. It cannot be set to change from Local to Remote control via the front panel menus.

```
Setup/Serial Remote Ctrl Menu

Control              Local                           *
SAbus Address        102                             *
Baud Rate            4800                            *
Port/Protocol        SCC3/RS232                    Quit
```

Control Option (When in Remote Control)

To access the Control option, press the **Control** softkey in the Remote Ctrl Menu.

> NOTE...
> This option is only shown if the Encoder is already in Remote control, to allow it to be set to Local control. It cannot be set to change from Local to Remote control via the front panel menus

```
Setup/Serial Remote Ctrl Edit

Control                                              +
             Local                                   –
                                                  Enter
Update using keypad or softkeys                   Quit
```

Table 4.29: Control Options

Selected Option	Description
Local	The Encoder is controlled locally.
Remote	The Encoder is controlled via the RS-232/485 Control Remote port.

SAbus Address Option

The SAbus protocol is multi-drop, and has an address byte for differentiating between the devices on the SAbus - the address option. To access the SAbus Address option, press the **SAbus Address** softkey in the `Remote Ctrl` Menu. This is used for remote control of the Encoder.

```
Setup/Serial Remote Ctrl Edit

SAbus Address                                          +
              102                                      –
                                                   Enter
Update using keypad or softkeys                     Quit
```

Table 4.30: SAbus Address Options

Selected Option		Description
Min:	49	SAbus address.
Max:	127	
Step Size:	1	

Baud Rate Option

To access the Baud Rate option, press the **Baud Rate** softkey in the `Remote Ctrl` Menu.

```
Setup/Serial Remote Ctrl Edit

Baud Rate                                              +
          4800                                         –
                                                   Enter
Update using softkeys                               Quit
```

Table 4.31: Baud Rate Options

Selected Option	Description
1200	1200 Baud rate.
2400	2400 Baud rate.
4800	4800 Baud rate.

Selected Option	Description
9600	9600 Baud rate.
19200	19200 Baud rate.
38400	38400 Baud rate.

Port/Protocol Option

To access the Port/Protocol option, press the **Port/Protocol** softkey in the `Remote Ctrl` Menu.

```
Setup/Serial Remote Ctrl Edit

Port/Protocol                                          +
                       SCC3/RS232                      –
                                                   Enter
Update using softkeys                               Quit
```

Table 4.32: Port/Protocol Options

Selected Option	Description
SCC3/RS232	SCC3 port, RS-232 protocol.
SCC4/RS485	SCC4 port, RS-485 protocol.

4.3.8 Reset Encoder

Press the **Reset Encoder** softkey, accessed from the System Menu, to reset the Encoder. The Encoder reboots, keeping the current configuration.

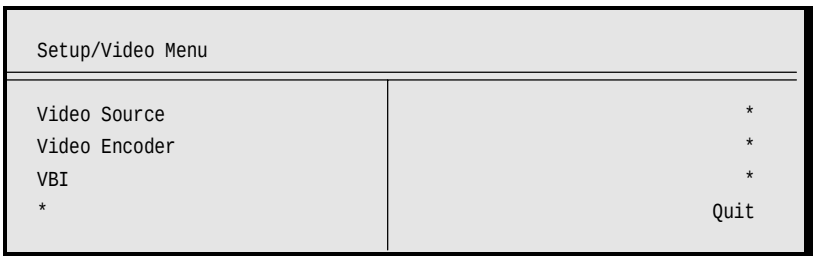
> CAUTION...
>
> The Reset Encoder option is not normally used.
> One example of its use is when the front panel has been upgraded.

4.4 Video Menu

4.4.1 Introduction

The Video Menu is selected from the Setup Menu by pressing the **Video** softkey.

This menu permits the selection of video parameters.



4.4.2 Video Source Menu

Overview

The Video Source Menu is selected from the Video Menu by pressing the **Video Source** softkey. This menu permits the selection of video source parameters. The screens vary according to the type of video source selected. Additional menus are displayed if the Analogue Video Input Option Module is fitted (see *Section 3.2*).

Video Source Option

To access the Video Source option, press the **Video Source** softkey from the Video Source Menu.

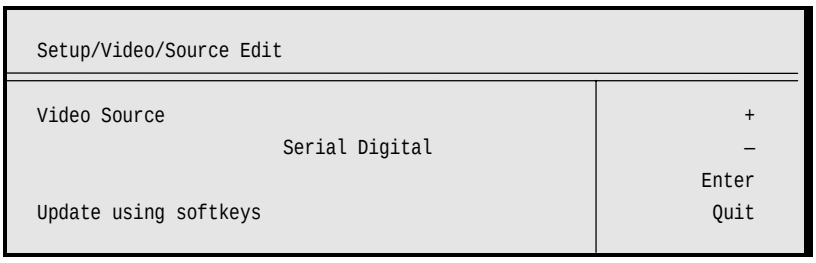


Table 4.33: Video Source Options

Video Type	Selected Option	Description	Comments
None	Off	Video input switched off.	
Analogue Composite and Analogue Component	*PAL-B/G/H/I	PAL-B/G/H/I composite video input on Y/COMP connector.	These options are not shown unless the Analogue Video Input Option Module is fitted.
	*PAL-M	PAL-M composite video input on Y/COMP connector.	
	*PAL-D	PAL-D composite video input on Y/COMP connector.	
	*NTSC with Pedestal	NTSC-M composite video input (with Pedestal) on Y/COMP connector.	
	*NTSC no Pedestal	NTSC-M composite video input (with no Pedestal) on Y/COMP connector.	
Monochrome Analogue and YPrPb	*Monochrome	The video input on the Y/COMP connector is encoded using only the luminance information. The frame rate selected indicates whether this input is a PAL or NTSC signal.	
	*YPrPb	525/625 line component video input on the $Y/C_R/C_B$ connectors.	
Ident, Digital and Internal Test Pattern Video Sources	Serial Digital	Serial digital video input on SDI connector.	
	Bars & Red	Colour bars and red internal test pattern.	
	Moving Pattern	Moving internal test pattern.	
	Ident (V3.3 on)	Video Source which allows the user to superimpose identification text on the video. Mainly used for test purposes.	

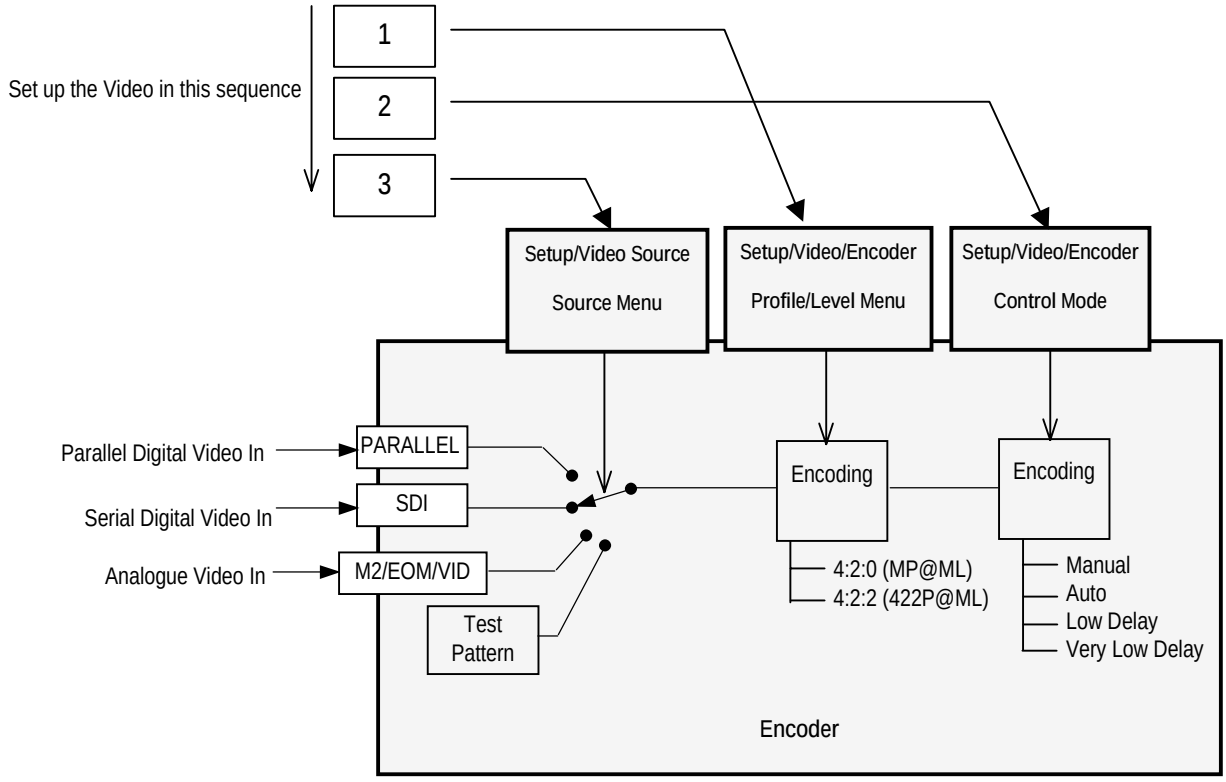


Figure 4.6: Setting Up the Video Input

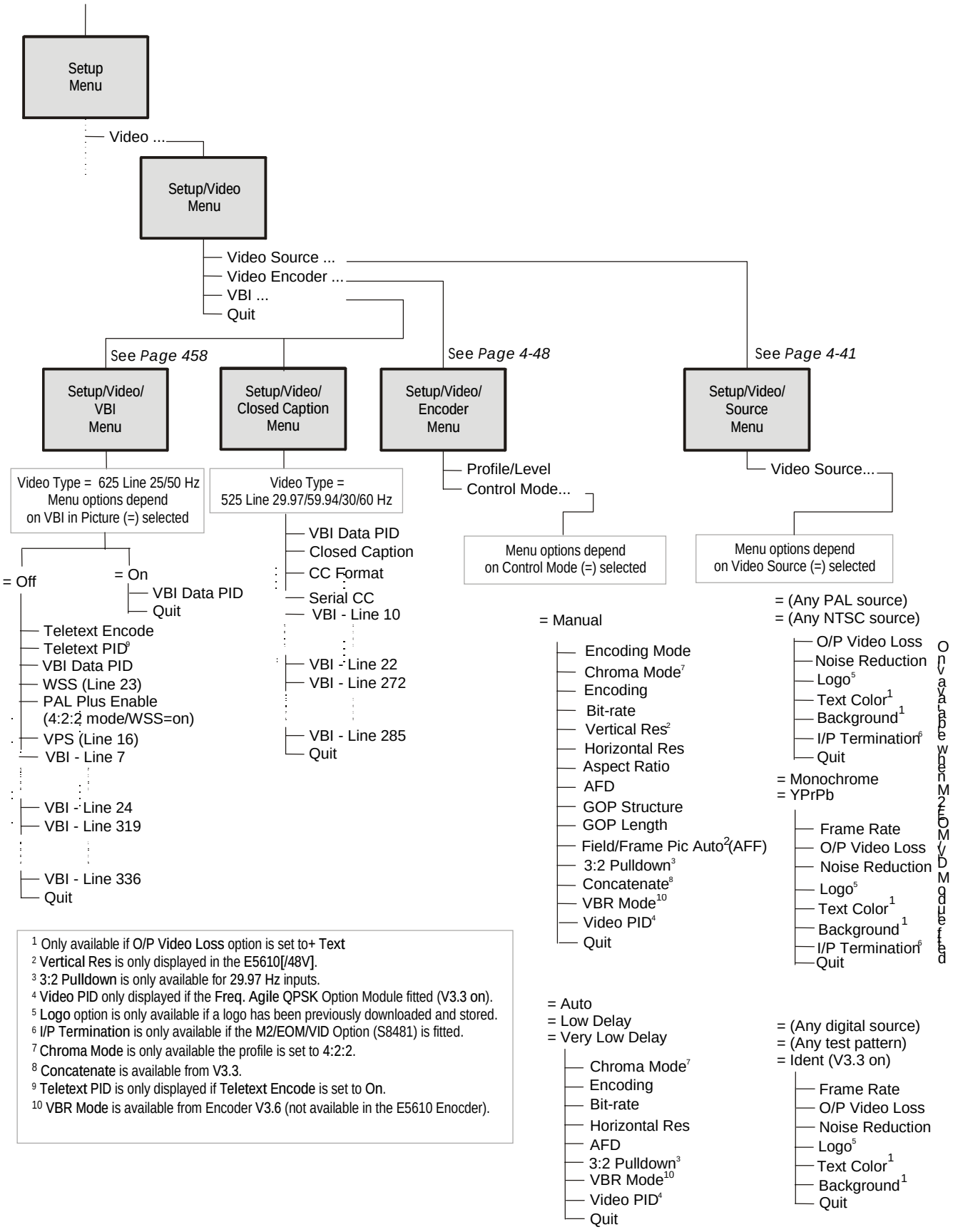


Figure 4.7: Menu Hierarchy – Setup/Video Menu

Video Source Option = Analogue Composite or Analogue Component

```
Setup/Video/Source Menu

Video Source          PAL – B/G/H/I          *
O/P Video Loss        Freeze Frame           ↓PgDn
Noise Reduction       Off                    *
Logo                  Disable                Quit
```

```
Setup/Video/Source Menu

Text Color            Black                  ↑PgUp
Background            White                  ↓PgDn
I/P Termination       On                     *
                                             Quit
```

Video Source Option = Monochrome Analogue or YPrPb

```
Setup/Video/Source Menu

Video Source          Monochrome             *
Frame Rate            29.97 Hz               ↓PgDn
O/P Video Loss        Freeze Frame           *
Noise Reduction       Off                    Quit
```

```
Setup/Video/Source Menu

Logo                  Disable                ↑PgUp
Text Color            Black                  ↓PgDn
Background            White                  *
I/P Termination       On                     Quit
```

Video Source = Ident, Digital or Internal Test Pattern

```
Setup/Video/Source Menu

Video Source          Serial Digital         *
Frame Rate            25 Hz                  ↓PgDn
O/P Video Loss        Freeze Frame           *
Noise Reduction       Off                    Quit
```

```
Setup/Video/Source Menu

Logo                  Off                    ↑PgUp
Text Color            Black                  ↓PgDn
Background            White                  *
                                             Quit
```

Frame Rate Option

> NOTE...
>
> The frame rate can only be set for SDI, monochrome or YprPb video inputs. The latter two are only available when the Encoder is fitted with an analogue Video Input Module.

To access the Frame Rate option, press the **Frame Rate** softkey from the Video Source Menu.

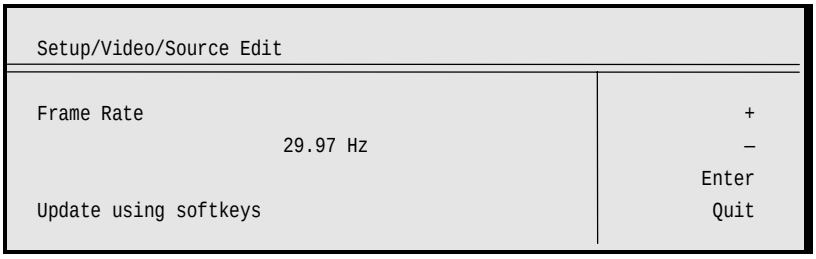


Table 4.34: Frame Rate Options

Selected Option	Description
29.97 Hz	Used in 525 lines (NTSC + PAL-M).
25 Hz	Used in 625 lines (PAL).

O/P Video Loss Option

This option gives the choice of what is displayed on the television screen in the event of losing video input. To access the O/P Video Loss option, press the **O/P Video Loss** softkey from the Video Source Menu.

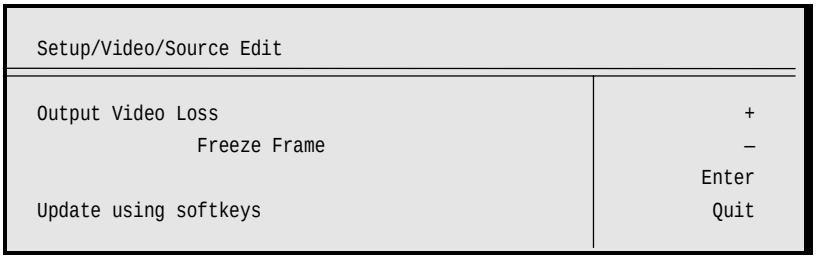


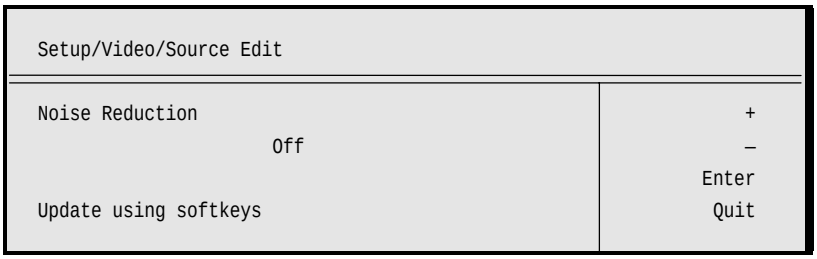
Table 4.35: O/P Video Loss Options

Selected Option	Description
Freeze Frame	The last video frame received is encoded if the video input is lost.
Black	A black screen is encoded if the video input is lost.
Bars & Red	Bars and red test pattern is encoded if the video input is lost.
Freeze Frame + text	The last video frame received is encoded if the video input is lost. Text message is superimposed.
Black + text	A black screen is encoded if the video input is lost. Text message is superimposed.
Bars & Red + text	Bars and red test pattern is encoded if the video input is lost. Text message is superimposed.

Noise Reduction Option

This option enables the noise reduction feature to be switched on or off. The feature can be used when the incoming picture material is corrupted by high frequency noise (such as white noise). When noise reduction is enabled, the Encoder applies sophisticated edge preserving filters on the incoming material which removes the noise and can reduce the encoding difficulty considerably.

To access the Noise Reduction option, press the **Noise Reduction** softkey from the Video Source Menu.



Logo Option

To access the Logo option, press the **Logo** softkey from the Video Source Menu. This gives the choice of overlaying the video with the broadcaster's logo.

> NOTE...
> This option only appears if the logo has previously been downloaded and stored in the equipment (see *Annex E, Creating and Downloading a Logo*).

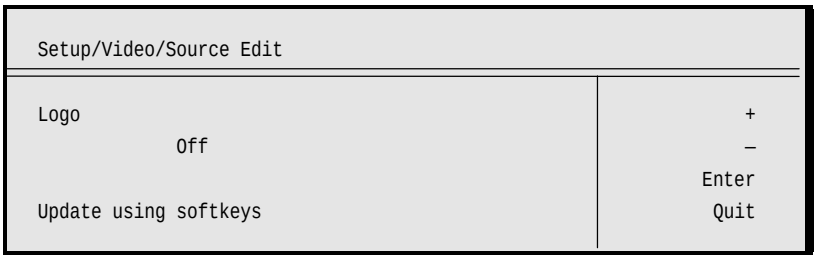


Table 4.36: Logo Options

Selected Option	Description
On	The logo is superimposed on the video.
Off	The logo is not superimposed on the video.

Text Color Option

To access the Text Color option, press the **Text Color** softkey from the Video Source Menu. This gives a choice of colours for the text which is displayed when the video output is lost (if that option has been selected).

NOTE...

This option only appears if one of the "+ text" O/P Video Loss options has been selected.

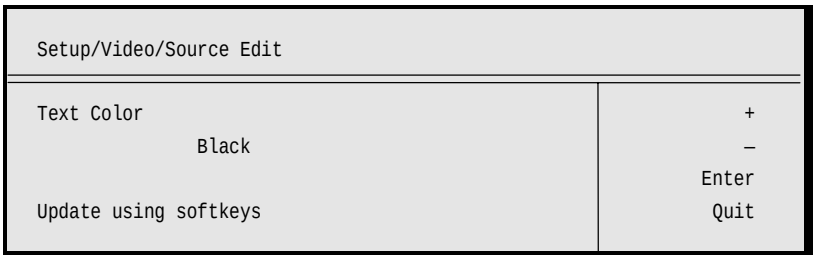


Table 4.37: Text Color Options

Available Options					
White	Blue	Magenta	Yellow	Green	Pink
Black	Red	Orange	Grey	Cyan	

Background Color Option

To access the Background Color option, press the **Background Color** softkey from the Video Source Menu. This gives a choice of colours for the background to the text which is displayed when the video output is lost (if that option has been selected).

NOTES...

1. This option only appears if one of the "+ text" O/P Video Loss options has been selected.
2. Make the background colour a contrast to the text otherwise the text will not be seen!

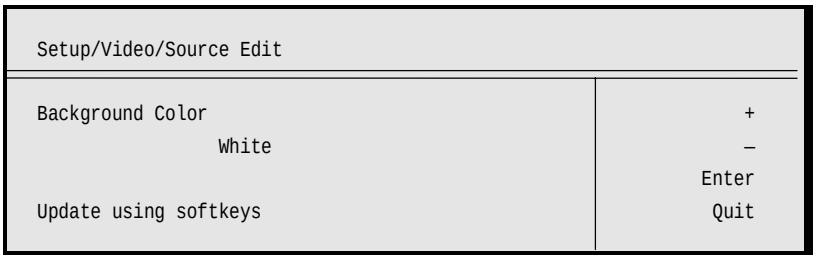


Table 4.38: Background Color Options

Available Options					
White	Blue	Magenta	Yellow	Green	Pink
Black	Red	Orange	Grey	Cyan	

I/P Termination Option

To access the I/P Termination option, press the **I/P Termination** softkey from the Video Source Menu. This enables the termination of the analogue video input to be switched on or off.

NOTE...

This option only appears if the analogue Video Input Module (S8481) is fitted.

```
Setup/Video/Source Edit

Input Termination                                    +
                    On—
                                                   Enter
Update using softkeys                               Quit
```

4.4.3 Video Encoder Menu

Overview

The Video Encoder Menu is selected from the Video Menu by pressing the **Video Encoder** softkey.

```
Setup/Video/Encoder Edit

Profile/Level          4:2:0 (MP@ML)                 *
Control Mode           Manual                      ↓PgDn
Encoding Mode          Standard                      *
Encoding                                            Quit
```

This menu permits the selection of video encoding parameters. The screens vary according to the control mode selected.

Profile/Level Option

To access the Profile/Level option, press the **Profile/Level** softkey in the Video Encoder Menu.

```
Setup/Video/Encoder Edit

Profile/Level                                        +
         422P@ML                                     —
                                                   Enter
Update using softkeys                               Quit
```

Table 4.39: Profile/Level Options

Selected Option	Used on...	Description
4:2:0 (MP@ML) MP@ML (on)	Model E5610[/48V] Models E5210 and E5410	Main Profile @ Main Level. Used in 4:2:0 direct to home.
422P@ML	Models E5410 and E5610[/48V]	4:2:2 Profile @ Main Level. Used in 4:2:2 contribution feed.

Control Mode Option

To access the Control Mode option, press the **Control Mode** softkey in the Video Encoder Menu. This enables various control modes to be selected in which some encoding parameters are automatically controlled (and therefore not shown on the menu), or manual control of all parameters.

```
Setup/Video/Encoder Edit

Control Mode                                    +
          Manual                                –
                                              Enter
Update using softkeys                         Quit
```

Table 4.40: Control Mode Options

Selected Option	Used on	Description
Manual		All encoding parameters can be controlled manually. Concatenate is available in this mode.
Auto		Pan Scan, Aspect Ratio, GOP Structure and GOP Length parameters controlled automatically. Uses IBBP GOP.
Low Delay		Low delay in encoding video signal achieved by trading-off video quality. Pan Scan, Aspect Ratio, GOP Structure and GOP Length parameters controlled automatically. Uses IP GOP.
Very Low Delay	Model E5610[/48V] only	Very low delay in encoding video signal achieved by trading-off video quality. Horizontal Res, Pan Scan, Aspect Ratio, GOP Structure and GOP Length parameters controlled automatically. Uses IP GOP.

Control Mode = Manual

```
Setup/Video/Encoder Menu

Profile/Level          422P@ML                  *
Control Mode           Manual                 ↓PgDn
Encoding Mode          Standard                 *
Chroma Mode            4:2:2                  Quit
```

Chroma Mode option is only shown on an E5610[/48V] Encoder set to 4:2:2

```
Setup/Video/Encoder Menu

Encoding               On                     ↑PgUp
Bit-rate               10.000 Mbit/s          ↓PgDn
Vertical Res           Full                     *
Horizontal Res         544                    Quit
```

```
Setup/Video/Encoder Menu

Aspect Ratio           4:3                    ↑PgUp
AFD                    Off                    ↓PgDn
GOP Structure          IBBP                     *
GOP Length             15                     Quit
```

```
Setup/Video/Encoder Menu

3:2 Pulldown           Off                    ↑PgUp
Field/Frame Pic Auto (AFF)                      *
Concatenate                                     *
Video PID                                      Quit
```

3:2 Pulldown is only available for 29.97 Hz inputs

Concatenate is only available when Control Mode is set to Manual

```
Setup/Video/Encoder Menu

VBR Mode              Off <constant>          ↑PgUp
                                              ↓PgDn
                                                 *
                                               Quit
```

Control Mode = Auto, Low Delay or Very Low Delay

```
Setup/Video/Encoder Menu

Profile/Level         MP @ ML                    *
Control Mode          Auto                    ↓PgDn
Chroma Mode           4:2:2                      *
Encoding              On                      Quit
```

3:2 Pulldown is only available for 29.97 Hz inputs

```
Setup/Video/Encoder Menu

Bitrate               8.000 Mbit/s            ↑PgUp
Horizontal Res        Auto (720)                 *
AFD                   Off                        *
3:2 Pulldown          Off                     Quit
```

```
Setup/Video/Encoder Menu

VBR Mode              Off <constant>          ↑PgUp
                                              ↓PgDn
                                                 *
                                               Quit
```

Encoding Mode Option

To access the Encoding Mode[3] option, press the **Encoding Mode** softkey in the Video Encoder Menu. This enables various encoding modes to be selected in which some encoding parameters are automatically controlled depending on the selected encoding delay.

> NOTE...
> The Encoding Mode option is only available when Control Mode is set to Manual.

```
Setup/Video/Encoder Edit

Encoding Mode                                    +
                      Standard                   –
                                              Enter
Update using softkeys                         Quit
```

[3] Only displayed if the Control Mode has been set to Manual.

Seamless 1 mode can use video bit rates from 0.8 Mbit/s to 10 Mbit/s, with the actual limits depending on video standard and resolution. This would be used for 4:2:0 DTH statistical multiplexing applications. Latency[4] is approximately 2.5 seconds.

Seamless 2 mode emulates System 3000 6U and 6U+ Encoders. Video bit-rate can be between 1.5 Mbit/s and 10 Mbit/s. Actual minimum and maximum rates depend on video standard and resolution.

Seamless 3 mode operates between 5 Mbit/s and 33 Mbit/s, with the actual limits depending on video standard and resolution. It would usually be used in 4:2:2 statistical multiplexing applications. Latency is approximately 1.1 seconds.

Seamless 4 mode has a very low B_{min}. Actual minimum and maximum depend on the video standard and resolution. This mode would typically be used for 4:2:0 DTH statistical multiplexing applications.

Seamless 5 mode minimum and maximum depend on the video standard and resolution.

Seamless 6 mode is typically used with 4:2:2 statistical multiplexing and a low B_{min}. Actual minimum and maximum depend on the video standard and resolution.

Table 4.41: Encoding Mode Options

Selected Option	Used on	Description
Seamless 1	E5610[/48V] only	This gives a fixed delay which allows the bit-rate to be changed without a break in transmission.
Seamless 2		
Seamless 3		
Seamless 4	E5610[/48V] only	From HD VCM 2.8 and later.
Seamless 5		
Seamless 6		
Mega Low Dly	All	Only works in 4:2:0 mode and the GOP structure used is IP. Can not be used with the external clock input as this mode doesn't use the frame synchroniser. The generated transport stream is not fully DVB compliant and therefore may not work with all decoders, so needs a suitable decoder. May not work with third party decoders. Above around 10Mbits/second gives similar results to very low delay
Very Low Dly	All	Delay is reduced using the same techniques as for low delay mode. GOP structure used is IP. Delay is further reduced by not using the frame synchroniser. Can not be used with the external clock input as the frame synchroniser is not used.
Low Delay	All	Delay is reduced by reducing the size of the video rate buffer. This will compromise video quality in some circumstances.
Standard	All	The normal delay, with no special techniques or fixed settings used to reduce encoding delay.

CAUTION...

If the bit-rate is changed there is a break in transmission.

[4] Latency is the end-to-end delay.

NOTES...

1. The encoding delay can be reduced from standard using additional options.
2. The delay is reduced by trading off video quality. The actual delay depends on video bit-rate.
3. In Seamless Modes 4, 5 and 6 coding performance is compromised to achieve lower Bmins.

Table 4.42: Seamless Mode Bit-rate

Profile	Seamless 1 (Mbit/s)	Seamless 2 (Mbit/s)	Seamless 3 (Mbit/s)	Seamless 4 (Mbit/s)	Seamless 5 (Mbit/s)	Seamless 6 (Mbit/s)
4:2:0	0.8 - 10	1.5 - 10	2 - 15	0.4 - 10	1 - 12	1 .3 - 10
4:2:2[5]	1.5 - 13	3 - 27	5 - 33	0.7 - 10	2.1 – 2.5	2.5 - 20
Rate Buffer delay (secs)	2.5	1.2	1	3.3	1.3	1

Chroma Mode Option

To set the Chroma Mode option, press the **Chroma Mode** softkey in the Video Encoder Menu.

NOTE...

Chroma Mode is displayed on Models E5410 and E5610[/48V] when the profile is set to 4:2:2.

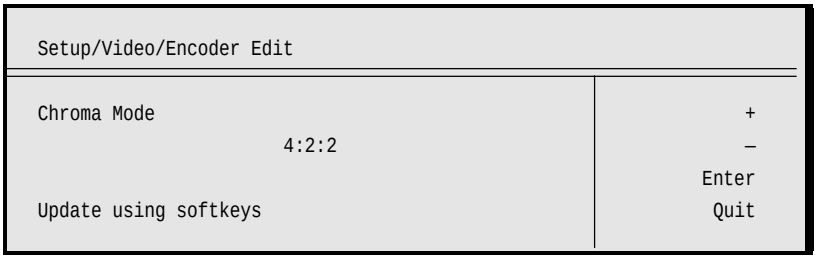
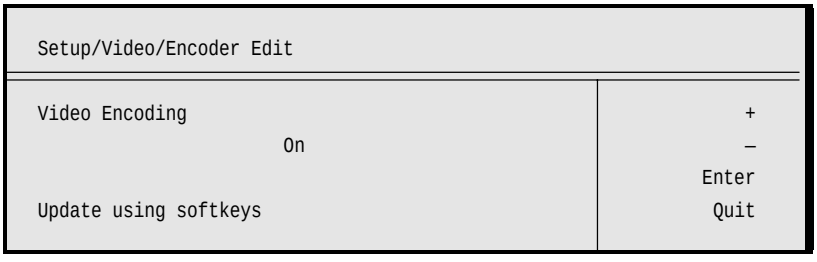


Table 4.43: Chroma Mode Options

Selected Option	Used on...	Description
4:2:0	All models	Relates to Chroma bandwidth.
4:2:2[5]	E5410 and E5610[/48V].	Relates to Chroma bandwidth.

Encoding Option

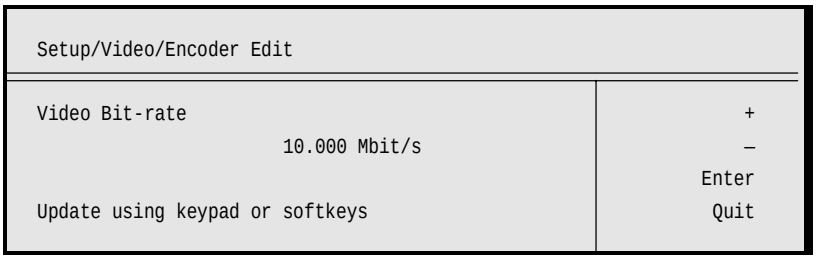
To access the Encoding option, press the **Encoding** softkey in the Video Encoder Menu. This enables encoding to be turned on or off. When the encoding is set to OFF, video packets are dropped from the outgoing transport stream.



[5] 4:2:2 mode is not supported in model E5210.

Bit-rate Option

To access the Bit-rate option, press the **Bit-rate** softkey in the Video Encoder Menu. The bit-rate value depends upon the Encoder version (see *Chapter 1, Introduction, Table 1.2*). An error message is shown with the correct range of bit-rates if the wrong rate is entered.



CAUTION...

When using the E5410/E5610[/48V] Encoder with a PRO IRD M2/PSR/3/422BAS in 4:2:2 mode the upper video bit-rate limit of the IRD is 25 Mbit/s.

Vertical Resolution Option

To access the Vertical Resolution option, press the **Vertical Res** softkey in the Video Encoder Menu.

NOTE...

Half vertical resolution is supported by Encoder model E5610[/48V] only.

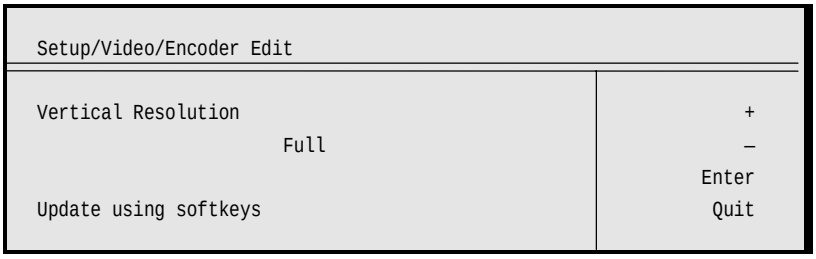


Table 4.44: Vertical Resolution Options

Selected Option	Used on...	Description
Half	E5610[/48V] only	Vertical resolution is half that of Full but may give better picture in low bit-rate.
Full	All models	480 lines in 29.97 Hz frame rate. 576 lines in 25 Hz frame rate.

Horizontal Resolution Option

To access the Horizontal Resolution option, press the **Horizontal Res** softkey in the Video Encoder Menu.

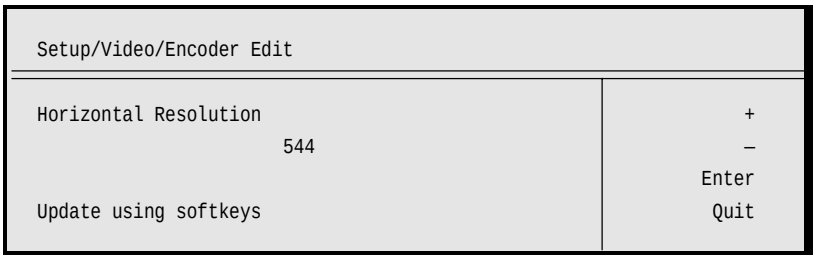


Table 4.45: Horizontal Resolution Options

Number in brackets varies according to the bit-rate that is set.

Selected Option	Used on...	Description
Auto (720)		Relates to the number of pixels across the screen.
320	E5210, E5410	
352	All models	Used with video bit-rates of < 2.5 Mbit/s[6].
368	E5210, E5410	
384	E5210, E5410	
480	All models	Used with video bit-rates of >= 2.5 Mbit/s[6].
544	All models	Used with video bit-rates of >= 4 Mbit/s[6].
640	E5210, E5410	
704	All models	
720	All models	Used with video bit-rates of >= 6 Mbit/s[6].

Aspect Ratio Option

To access the Aspect Ratio option, press the **Aspect Ratio** softkey in the Video Encoder Menu.

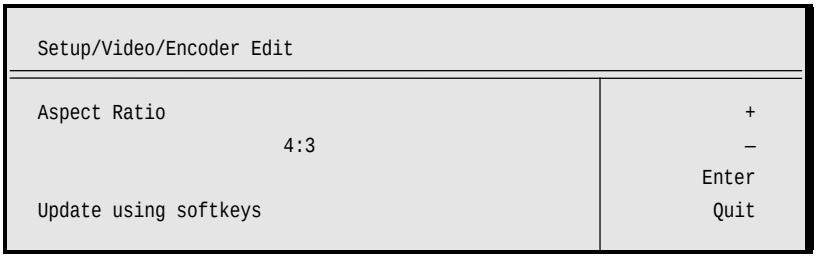


Table 4.46: Aspect Ratio Options

Selected Option	Description
1:1	Video image is encoded at 1:1 aspect ratio. Not currently used.
4:3	Video image is encoded at 4:3 aspect ratio. Default.
16:9	Video image is encoded at 16:9 aspect ratio. Used for digital transmissions.
2.21:1	Video image is encoded at 2.21:1 aspect ratio. Not currently used.

Active Format Descriptor (AFD) Option

AFD uses three bits of video index to define the video format. This information is encoded into user data and can then be used by a decoder for wide-screen switching. To access the AFD option, press the **AFD** softkey in the Video Encoder Menu.

> NOTE...
> Video Index must be switched on in the VBI to enable the AFD option (see *Table 4.53*).

[6] Horizontal resolutions of 352, 480, 544 and 720 are only used if auto setting is selected.

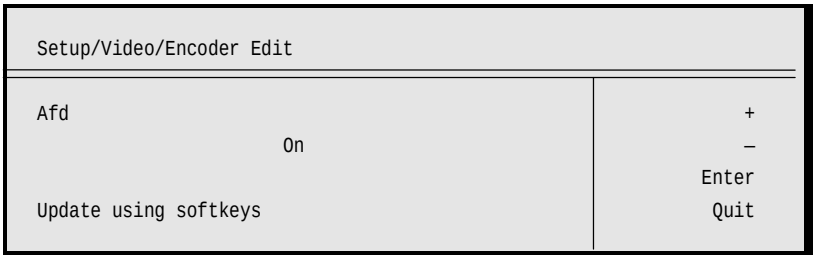


Table 4.47: AFD Options

Selected Option	Description
Off	
On	
On (No Reset)	

Group of Pictures (GOP) Structure Option

To access the Group of Pictures (GOP) Structure option, press the **GOP Structure** softkey in the Video Encoder Menu.

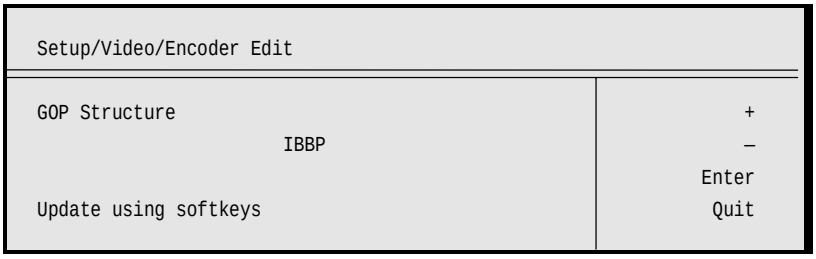


Table 4.48: Group of Pictures Structure Options

Selected Option	Used on...	Description
IBBBP only	E5610[/48V]	(IBBBPBBBPBBBI).
IBBP	All	for successive B frames (IBBPBBPBBPBBPI) – default.
IBP	All	for operation with B frames (IBPBPBPBPBPI).
IP	All	for non-B frame operation (IPPPPPPPPPPI) - default for low delay mode.
IBBB only	E5610[/48V]	(IBBBIBBBIBBBIBBB) - professional editing standard.
IBB	All	IBBIBBIBBIBBIBBIBBI) - professional editing standard.
IB	All	(IBIBIBIBIBIBIBIBIB) - a superior professional editing standard.
I-Frame	All	(IIIIIIIIIIIIII) - for precise editing and compression.

> NOTE...
> For some GOP changes operation can be seamless but this is not guaranteed.

Group of Pictures (GOP) Length Option

To access the Group of Pictures (GOP) Length option, press the **GOP Length** softkey in the Video Encoder Menu.

This enables the video GOP structure length to be set. The structure length determines how regularly an I frame is transmitted. The I frame provides a regular reference from which predicted frames can be generated, thereby ensuring that predictions do not become wildly inaccurate.

> NOTE...
>
> Some of the settings may not be available if they are not valid for use with other current encoding parameters. Also, changing the GOP structure automatically changes the GOP length if the current GOP length is not compatible with the selected structure.

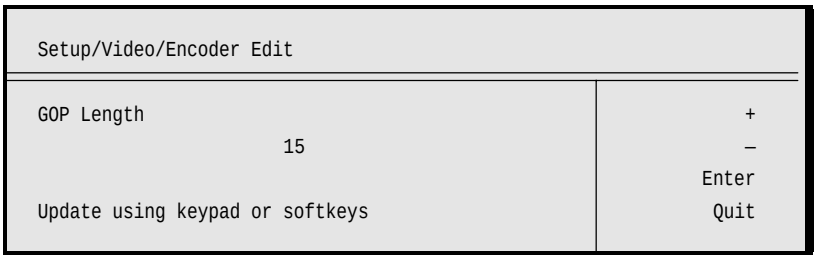


Table 4.49: Group of Pictures Length Options

Valid Input Range		Description
Min:	1	GOP lengths available depend on GOP structure selected.
Max:	15	

Field/Frame Pic Auto (AFF) Option

To access the Field/Frame Pic Auto (AFF) option, press the **Field/Frame Pic Auto (AFF)** softkey in the Video Encoder Menu. This enables the choice of a field or frame based picture.

MPEG-2 encodes video at the field/frame level in what are known as pictures. These are coding units within the hierarchy of the spec. **Pictures** can be used in two ways, frame pictures and field pictures. With frame pictures a **frame** of video comprising of a field1 and field2 is encoded as a single unit. With field pictures each individual **field** of video is encoded as a single unit, but must be followed or preceded by another **field picture** relating to its matching field.

> NOTES...
>
> 4. Field/Frame Pic Auto (AFF) Option is supported by Encoder model E5610[/48V] only.
> 5. The E5210/E5410 Encoders are set to 'Auto (AFF)' and cannot be changed

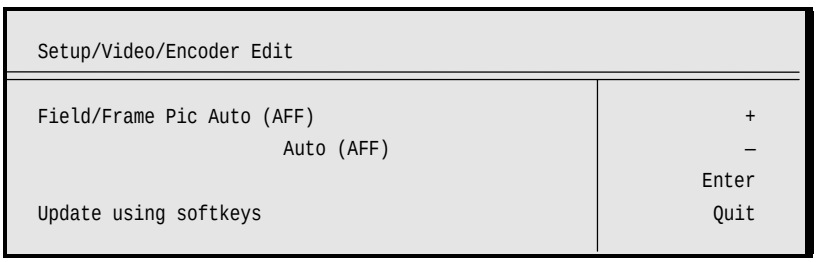


Table 4.50: Field/Frame Pic Auto (AFF) Options

Selected Option	Description
Field	Field based pictures.
Frame	Frame based pictures.
Auto (AFF)	Automatically chooses the correct option on a frame by frame basis.

3:2 Pulldown Option

To access the 3:2 Pulldown option, press the **3:2 Pulldown** softkey in the Video Encoder Menu. This enables 3:2 pulldown (film) mode to be switched on and off.

> NOTE...
> This option is only available if a 525 line 29.97 Hz (NTSC) video source is selected.

The option should be switched on if the video material originated on film and has been converted from the 24 frames per second film rate to the 30 frames per second NTSC rate. This enables the Encoder to increase the video compression by only including a flag in the transport stream to represent a repeated field (when detected), rather than compressing the repeated fields.

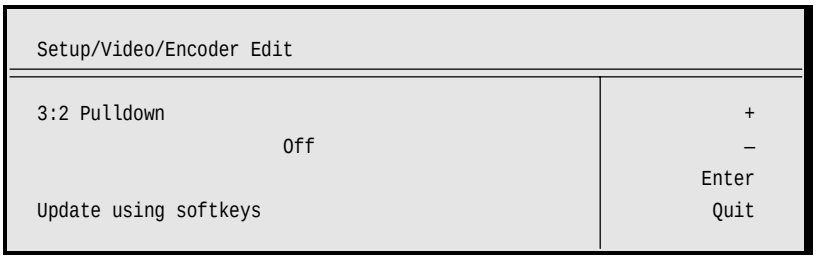


Table 4.51: 3:2 Pulldown Options

Selected Option	Description
On	3:2 pulldown (film) mode is switched on.
Off	3:2 pulldown (film) mode is switched off.

Concatenation (V3.3 on)

Use this option if the signal has been coded, then decoded and is about to be coded again. Setting this option may give better results as it tries to line up the I-frames.

> NOTE...
> This option is only displayed if the Control Mode is set to Manual.

VBR Mode (V3.6 on)

The VBR Mode option is selected from the Menu by pressing the **VBR Mode** softkey. The option is used to provide spare capacity in the video stream.

Operating in a **stuffing off** mode or in a true **variable bit rate** mode, a decision can be made as to how much impact there will be on the broadcast service. The spare capacity these modes provide is ideal for opportunistic data insertion.

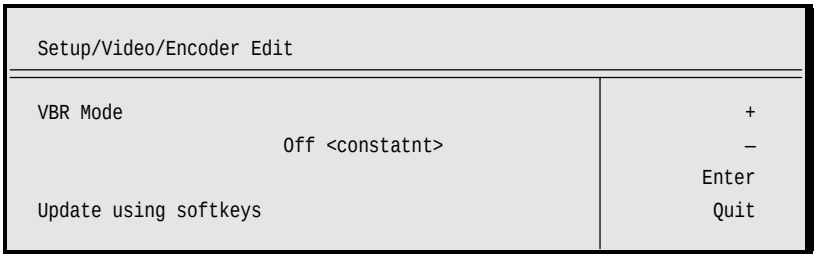


Table 4.52: VBR Mode Options

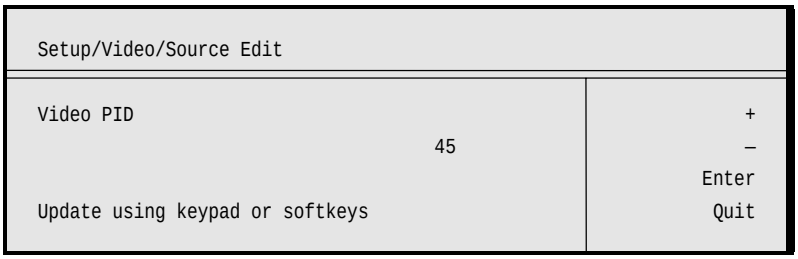
Selected Option	Description
Off <constant>	VBR mode not selected. Any unused bits are stuffed.
On <stuffing off>	This uses normal quantisation levels and any unused bits are used to carry other data. This has no impact on the quality of the encoded pictures.
On <variable>	Quantisation level is limited with pictures which are easier to encode. This is done in order to provide more unused bits to carry other data. This may have an impact on the quality of certain encoded pictures.

NOTE...
The VBR Mode options are not available in the E5610 Encoder.

Video PID Option (V3.3 on)

The Video PID option is selected from the Menu by pressing the **Video PID** softkey. The option is used for entering or updating video PIDs, as required. Enter a PID using the keypad, then press the **Enter** softkey to enter it (see *page 3-8, Allocating PIDs*).

NOTE...
This option is only displayed if the Frequency Agile QPSK Option Module is fitted.



4.4.4 Vertical Blanking Interval (VBI) Menu

When VBI in Picture = On

In this situation, the only additional option displayed is VBI Data PID.

When VBI in Picture = Off

The VBI Menu is selected from the Video Menu by pressing the **VBI** softkey. This menu permits the selection of VBI parameters.

The VBI lines vary, according to whether the video source is 525 lines, 29.97 Hz or 625 lines, 25 Hz. If 525, the options are VBI Lines 10-22 and 273-285; if 625, the options are VBI Lines 7-24 and 319-336. These have the same options as VBI - Line 7 and are changed in the same way.

525 Line 29.97 Hz Input

```
Setup/Video/VBI Menu

VBI in Picture        Off                    *
VBI Data PID          Off                 ↓PgDn
Closed Caption        0                      *
Serial CC             Off                 Quit
```

```
Setup/Video/VBI Menu

VBI – Line 10         Off                 ↑PgUp
VBI – Line 11         Off                 ↓PgDn
VBI – Line 12         Off                    *
VBI – Line 13         Off                 Quit
```

More screens present options for VBI lines 14 to 22 and 273 to 285.

625 Line 25 Hz Input

```
Setup/Video/VBI Menu

VBI in Picture        Off                    *
Teletext Encode       On                  ↓PgDn
VBI Data PID          Off                    *
WSS (Line 23)         On                  Quit
```

```
Setup/Video/VBI Menu

PAL Plus Enable       Auto                ↑PgUp
VPS (Line 16)         On                  ↓PgDn
VBI - Line 7          Off                    *
VBI – Line 8          Off                 Quit
```

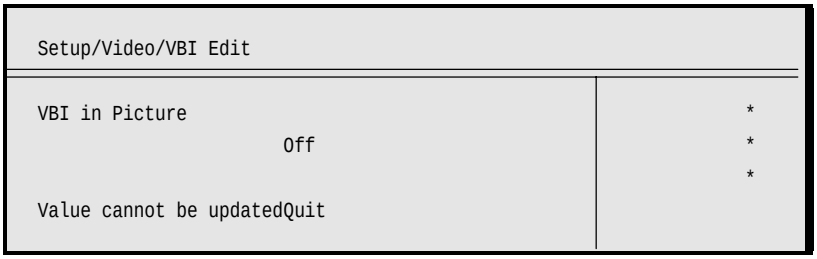
More screens present options for VBI lines 9 to 24 and 319 to 336.

VBI In Picture Option

NOTES...

1. The VBI in Picture option is only accessible if the selected video profile/level is 422P@ML. Only available on E5410 and E5610[/48V] Encoders or E5210 with the 4:2:2 upgrade.
2. VBI in Picture transmits the VBI waveform as part of the picture and as such will be subject to some distortion. Most analogue VBI types are robust against this type of distortion but others, e.g. Video Index, are intended for SDI transmission and will not survive MPEG coding/decoding in VBI in Picture mode.

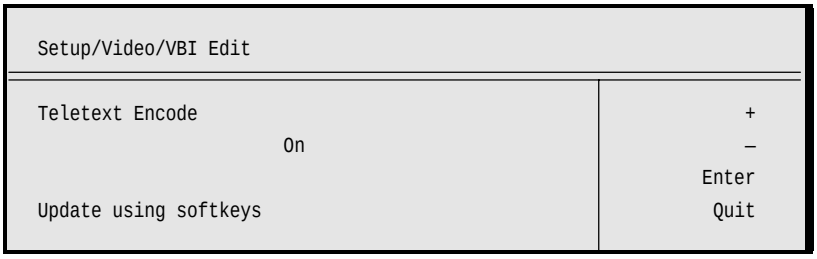
To access the VBI In Picture option, press the **VBI In Picture** softkey in the VBI Menu. This enables the extended picture format available in the MPEG 4:2:2 specification to be selected. When selected, the encoder compresses and transmits the VBI data as part of the active picture. This mode requires up to 3 Mbit/s of extra bit-rate, depending on the amount and complexity of the VBI present. When this option is not selected (or when 4:2:0 format video is used), VBI data is transmitted in its original digital form either in an independent data stream (in the case of Teletext) or in user data fields within the MPEG video transport stream.



Teletext Encode Option

To access the Teletext Encode option, press the **Teletext Encode** softkey in the VBI Menu. This enables extraction of Teletext System B (or World System Teletext) or Inverted Teletext (from V3.3) data from lines 7 to 22 and 320 to 335 of the video input.

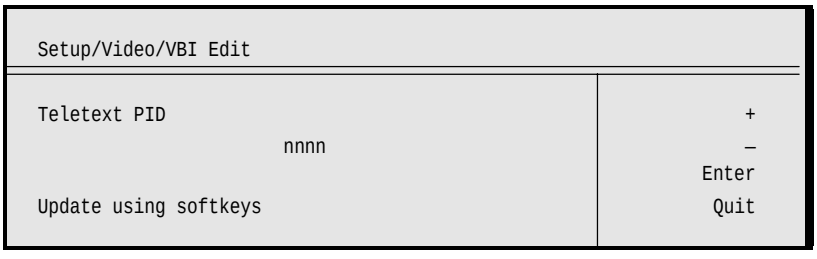
> NOTE...
> The Teletext Encode option is only available when the Frame Rate is set to 25 or 50 Hz.



Teletext PID Option

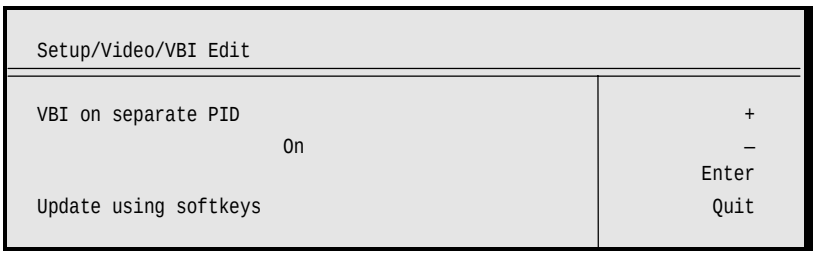
To access the Teletext PID option, press the **Teletext PID** softkey in the VBI Menu. This enables the Text PID to be allocated.

> NOTES...
> 1. This option is only displayed when Teletext Encode is set to On.
> 2. The default PID for Teletext is 111 hex (273 denary). The Teletext PID option can allocate a different PID for this (in the range 32 – 8191 denary).



VBI Data PID Option

To access the VBI Data PID option, press the **VBI Data PID** softkey in the VBI Menu. This enables the VBI Data PID to be turned On or Off.

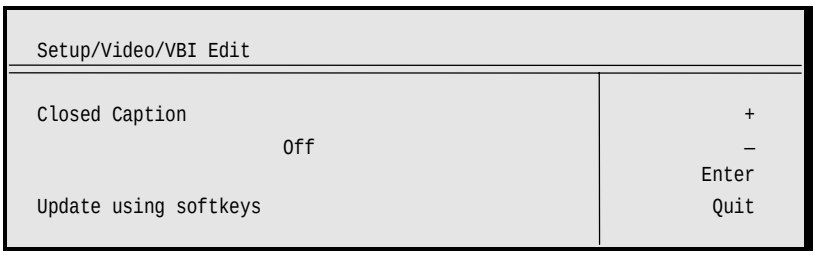


Closed Caption / Serial CC Option

To access the Closed Caption option, press the **Closed Caption** softkey in the VBI Menu. This enables the extraction of closed captioning data from line 21 of the video input.

To access the Serial CC (Closed Caption) option, press the Serial **CC** softkey in the VBI Menu. This inserts the closed captions as user data in the video stream.

> NOTES...
>
> 1. This option is only displayed if the video source is set to NTSC.
> 2. The debug menu (not described in this manual) allows various Closed Caption formats to be chosen. They are only available when in DVB mode.



CC Format

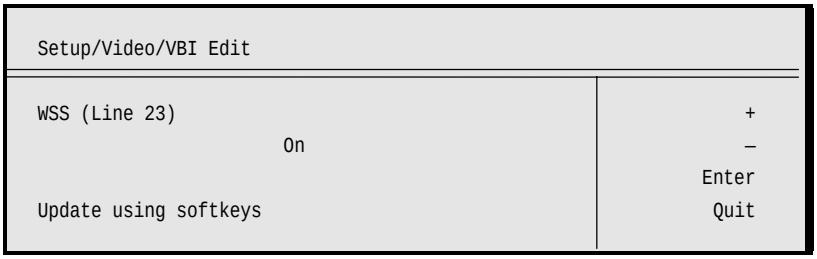
> NOTE...
>
> Only available when Frame Rate = any of 60/59.94/30/29.97 Hz.

This option allows the CC format to be toggled between ATSC and a (DVB) TANDBERG proprietary scheme.

WSS (Line 23) Option

To access the WSS (Line 23) option, press the **WSS (Line 23)** softkey in the VBI Menu. This enables the extraction of WSS (Wide Screen Signalling) data from line 23 of the video input.

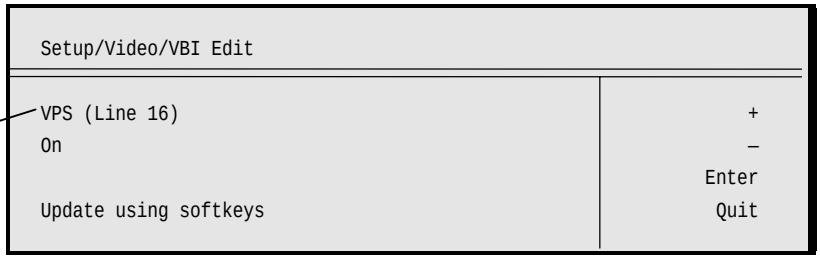
> NOTE...
>
> This parameter is only shown if the video source is set to PAL.



VPS (Line 16) Option

To access the VPS (Line 16) option, press the **VPS (Line 16)** softkey in the VBI Menu. This enables the extraction of VPS (Video Programming System) data from line 16 of the video input.

VPS is only applicable to line 16



VBI - Line ‘n’ Option

To access the VBI - Line ‘n’ option, press the **VBI - Line** ‘n’ softkey in the VBI Menu (the line number shown changes according to the line option selected). This enables extraction of VBI data from the selected line, and specifies the type of VBI data that the line contains.

VBI data is applicable to various lines

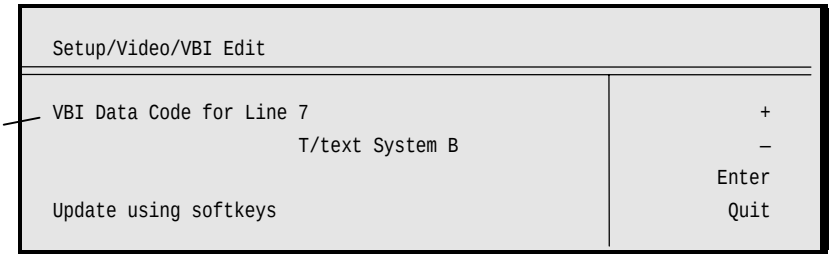


Table 4.53: VBI - Line 'n' Options

Selected Option	Description	Line
525 Line 29.97 Hz Video		
Off	VBI data is not extracted from the line.	
Vertical Interval Time Code	VITC data extracted from the line.	14
Closed Caption	The setting cannot be selected on this screen, but is set by setting the **Closed Caption** option to **On**. It indicates that closed captioning data is extracted from the line. Setting Line 21 back to **Off** or VITC resets the **Closed Caption** option back to **Off**.	21
Neilsen AMOL 1	Neilsen AMOL 1 data is extracted from the line.	20 and/or 285
Neilsen AMOL 11	This setting applies to Lines only. Neilsen AMOL 11 data is extracted from the line.	20, 22, 283 and 285
625 Line 25 Hz Video		
Off	VBI data is not extracted from the line.	
Vertical Interval Time Code	VITC data extracted from the line.	16 or 22
Video Index	Lines 11 and 324 must be set to Video Index for Active Format Descriptor (AFD) to function.	11, 324
Teletext System B (World System Teletext)	Teletext System B data extracted from the line or lines.	7 – 22 and 320 - 335
Inverted Teletext	Inverted Teletext data extracted from the line or lines (from V3.5).	7 – 22 and 320 - 335
Wide Screen Signalling	The setting cannot be selected on this screen, but is set by setting the **WSS (Line 23)** option to **On**. It indicates that WSS data is extracted from the line. Setting Line 23 back to **Off**, VITC or **Teletext System B** resets the **WSS (Line 23)** option back to **Off**.	23
Video Programming System	The setting cannot be selected on this screen, but is set by setting the **VPS (Line 16)** option to **On**. It indicates that VPS data is extracted from the line. Setting Line 16 back to **Off**, VITC, **Teletext System B** or **Inverted Teletext** resets the **VPS (Line 16)** option back to **Off**.	16

FIELD 1			FIELD 2		
			272	9	VITC (SMPTE), Video Index, Off
			273	10	VITC (SMPTE), Video Index, Off
11	11	VITC (SMPTE), Video Index, Off	274	11	VITC (SMPTE), Video Index, Off
12	12	VITC (SMPTE), Video Index, Off	275	12	VITC (SMPTE), Video Index, Off
13	13	VITC (SMPTE), Video Index, Off	276	13	VITC (SMPTE), Video Index, Off
14	14	VITC (SMPTE), Video Index, Off	277	14	VITC (SMPTE), Video Index, Off
15	15	VITC (SMPTE), Video Index, Off	278	15	VITC (SMPTE), Video Index, Off
16	16	VITC (SMPTE), Video Index, Off	279	16	VITC (SMPTE), Video Index, Off
17	17	VITC (SMPTE), Video Index, Off	280	17	VITC (SMPTE), Video Index, Off
18	18	VITC (SMPTE), Video Index, Off	281	18	VITC (SMPTE), Video Index, Off
19	19	VITC (SMPTE), Video Index, Off	282	19	VITC (SMPTE), Video Index, Off
20	20	VITC (SMPTE), Video Index, Neilson AMOLI, Neilson AMOLII, Off	283	20	VITC (SMPTE), Video Index, Neilson AMOLII, Off
21	21	VITC (SMPTE), Video Index, Closed Caption, Off	284	21	VITC (SMPTE), Video Index, Extended Data, Off
22	22	VITC (SMPTE), Video Index, Neilson AMOLII, Off	285	22	VITC (SMPTE), Video Index, Neilson AMOLI, Neilson AMOLII, Off
23 - 262	23 - 262	ACTIVE VIDEO	286 - 525	23 - 262	ACTIVE VIDEO
263	263	ACTIVE VIDEO / Equalising pulses			
Line Number (whole frame)	Line Number (field by field)		Line Number (whole frame)	Line Number (field by field)	

NOTES...

1. In 525-line systems, fields start on the first full line after the end of the picture period. Therefore, field 1 is 262 lines long and field 2 is 263 lines long.
2. An MPEG frame is 480 lines when formatting 525-line format pictures.
3. Vertical Interval Time Code (VITC) is carried in line 14 of each field (SMPTE RP 164-1992). Some older equipment may require VITC to be duplicated on two lines in each field. The preferred lines for this are 14 and 16.

Figure 4.8: VBI Structure Implemented by TANDBERG for 525-line Systems

FIELD 1		FIELD 2	
7	System B Teletext or Inverted Teletext, VITC, Video Index, Off	319	System B Teletext or Inverted Teletext, VITC, Video Index, Off
8	System B Teletext or Inverted Teletext, VITC, Video Index, Off	320	System B Teletext or Inverted Teletext, VITC, Video Index, Off
9	System B Teletext or Inverted Teletext, VITC, Video Index, Off	321	System B Teletext or Inverted Teletext, VITC, Video Index, Off
10	System B Teletext or Inverted Teletext, VITC, Video Index, Off	322	System B Teletext or Inverted Teletext, VITC, Video Index, Off
11	System B Teletext or Inverted Teletext, VITC, Video Index, Off	323	System B Teletext or Inverted Teletext, VITC, Video Index, Off
12	System B Teletext or Inverted Teletext, VITC, Video Index, Off	324	System B Teletext or Inverted Teletext, VITC, Video Index, Off
13	System B Teletext or Inverted Teletext, VITC, Video Index, Off	325	System B Teletext or Inverted Teletext, VITC, Video Index, Off
14	System B Teletext or Inverted Teletext, VITC, Video Index, Off	326	System B Teletext or Inverted Teletext, VITC, Video Index, Off
15	System B Teletext or Inverted Teletext, VITC, Video Index, Off	327	System B Teletext or Inverted Teletext, VITC, Video Index, Off
16	System B Teletext or Inverted Teletext, VITC, Video Index, Video Programming System (VPS), Off	328	System B Teletext or Inverted Teletext, VITC, Video Index, Off
17	System B Teletext or Inverted Teletext, VITC, Video Index, Off	329	System B Teletext or Inverted Teletext, VITC, Video Index, Video Programming System (VPS), Off
18	System B Teletext or Inverted Teletext, VITC, Video Index, Off	330	System B Teletext or Inverted Teletext, VITC, Video Index, Off
19	System B Teletext or Inverted Teletext, VITC, Video Index, Off	331	System B Teletext or Inverted Teletext, VITC, Video Index, Off
20	System B Teletext or Inverted Teletext, VITC, Video Index, Off	332	System B Teletext or Inverted Teletext, VITC, Video Index, Off
21	System B Teletext or Inverted Teletext, VITC, Video Index, Off	333	System B Teletext or Inverted Teletext, VITC, Video Index, Off
22	System B Teletext or Inverted Teletext, VITC, Video Index, Closed Captions, Off	334	System B Teletext or Inverted Teletext, VITC, Video Index, Extended Data, Off
23	System B Teletext or Inverted Teletext, VITC, Video Index, Closed Captions, Wide Screen Signalling (WSS), Off	335	System B Teletext or Inverted Teletext, VITC, Video Index, Extended Data, Off
24	System B Teletext or Inverted Teletext, VITC, Video Index, Closed Captions, Off	336	System B Teletext or Inverted Teletext, VITC, Video Index, Extended Data, Off
25 - 310	ACTIVE VIDEO	337 - 622	ACTIVE VIDEO
311 - 312	Equalising Pulses	623	ACTIVE VIDEO / Equalising Pulses
313	Equalising Pulses (part)	624 - 625	Equalising Pulses

NOTES...

1. 625-line fields start on the leading edge of the first vertical sync (broad) pulse. Therefore, the first half of line 313 is in field 1 and the second half is in field 2.
2. An MPEG frame is 576 lines when formatting 625-line format pictures.
3. Inverted Teletext was introduced in V3.5.
4. Line 23 is the Wide Screen Signalling line. It carries information which defines the picture Aspect Ratio. It also carries information used by advanced TV receivers.
5. ETS 300 294 is the specification which describes WSS.
6. EN 300 472 is the specification associated with System B Teletext (World System Teletext).

Figure 4.9: VBI Structure Implemented by TANDBERG for 625-line Systems

4.5 Audio Menu

4.5.1 Overview

The Audio Menu is selected from the Setup Menu by pressing the **Audio** softkey.

This menu permits the selection of audio parameters.

There are extra options if an Additional Audio Input Option Module is fitted.

```
Setup/Audio Menu

Channel 1A                                  Languages
Channel 1B                                          *
Channel 2A                                          *
Channel 2B                                       Quit
```

4.5.2 Channel 1A & 1B / 2A & 2B / 3A & 3B Menus

Introduction

Channels 1A / 1B (also 2A / 2B and 3A / 3B if Additional Audio Input option modules are fitted – see *Section 3.3*) all have the same menu options[7], depending upon the Coding Standard selected. Channel 1A menus are typically shown as examples. The Channel 1A Menu is selected from the Audio Menu by pressing the **Channel 1A** softkey.

This menu permits the selection of individual channel audio parameters.

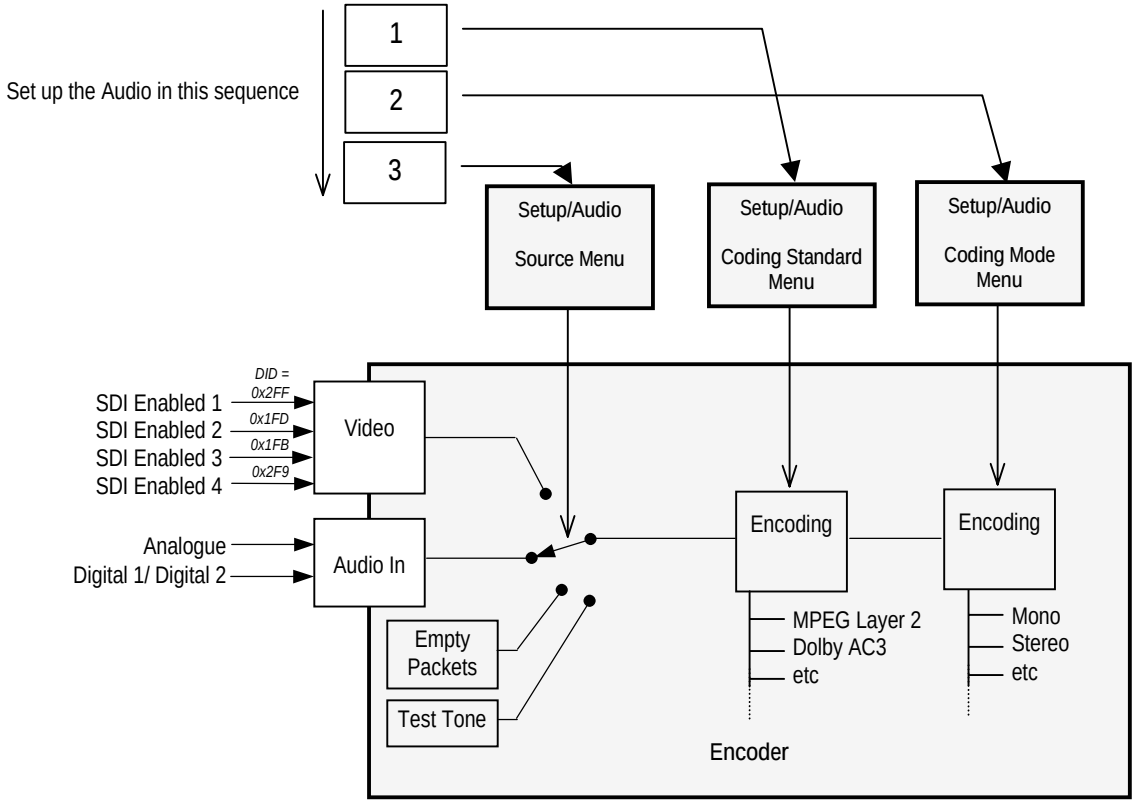
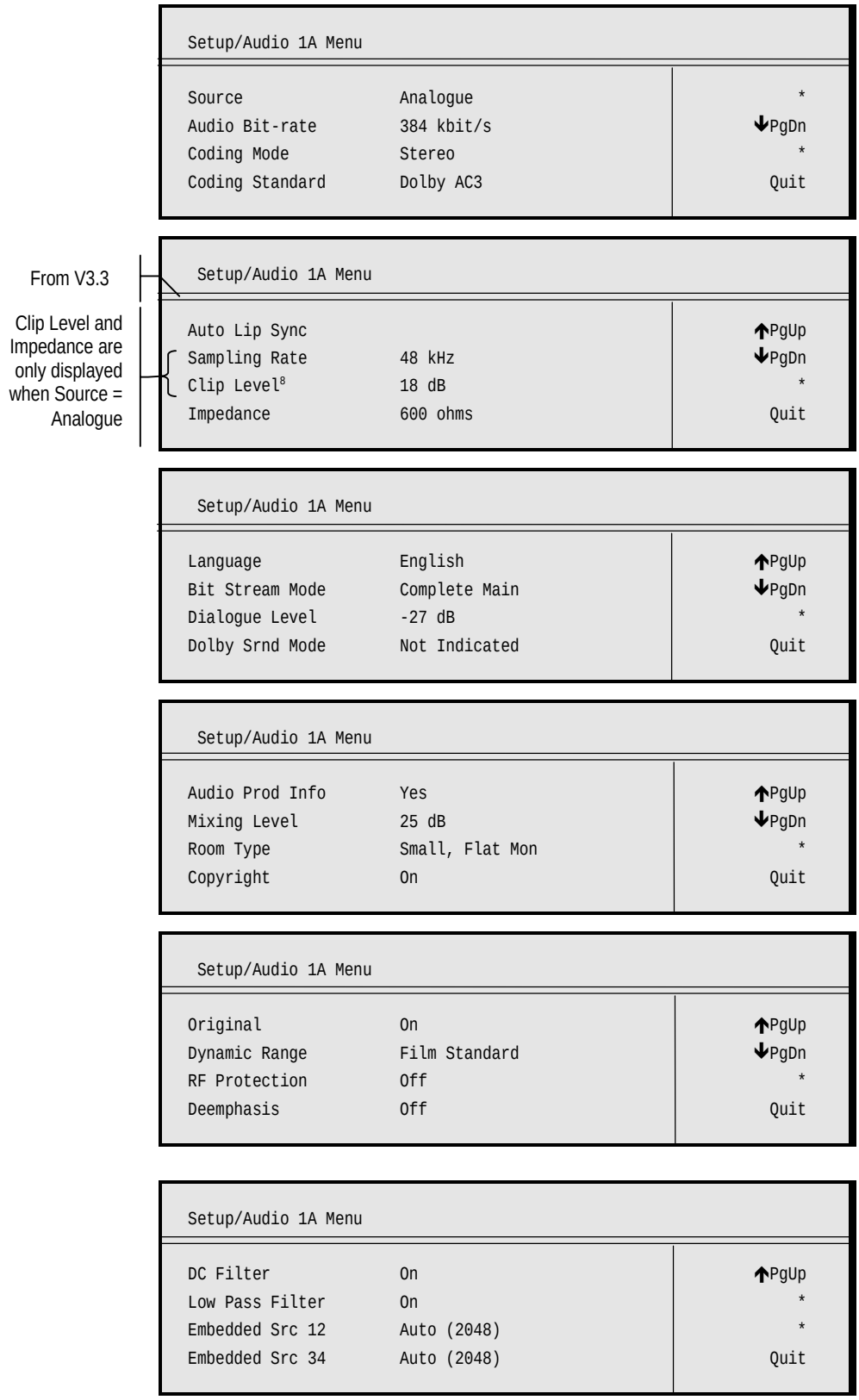


Figure 4.10: Setting up the Audio Input

[7] The exception to this is the M2/EOM/DOLBY-AC3 option which is only available in Channels 2A/2B and 3A/3B.

Coding Standard = Dolby AC-3

This option is only available if licensed in the M2/EOM/AUD audio module.



[8] Clip Level was shown as Gain on versions 3.0 – 3.2

Audio PID displayed if Frequency Agile QPSK Option Module fitted.

```
Setup/Audio 1A Menu

Audio PID            On                  ↑PgUp
                                             *
                                             *
                                          Quit
```

Coding Standard = Pre-encoded AC-3

This option is only available if licensed in the M2/EOM/AUD audio module.

```
Setup/Audio 1A Menu

Source               Digital 1               *
Coding Standard      Pre-encoded AC3     ↓PgDn
Language             English                 *
External Delay       179ms                Quit
```

Audio PID displayed if Frequency Agile QPSK Option Module fitted.

```
Setup/Audio 1A Menu

AES/EBU Output       Off                 ↑PgUp
Embedded Src 12      Auto (2048)             *
Embedded Src 34      Auto (2048)             *
Audio PID                                 Quit
```

Coding Standard = MPEG Layer 2

```
Setup/Audio 1A Menu

Source               Analogue                *
Audio Bit-rate       384 kbit/s          ↓PgDn
Coding Mode          Stereo                  *
Coding Standard      MPEG Layer 2         Quit
```

From V3.3 (Auto Lip Sync)

Clip Level and Impedance are only displayed when Source = Analogue

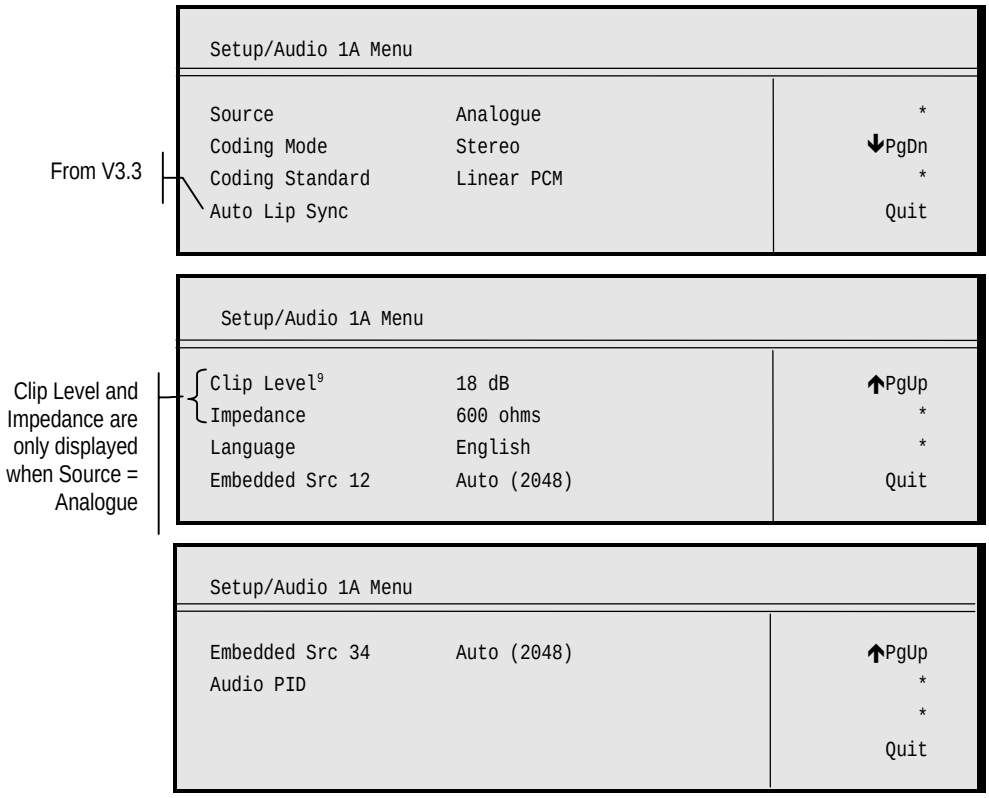
```
Setup/Audio 1A Menu

Auto Lip Sync        On                  ↑PgUp
Clip Level[9]        18 dB               ↓PgDn
Impedance            600 ohms                *
Language             English              Quit
```

Audio PID displayed if Frequency Agile QPSK Option Module fitted.

```
Setup/Audio 1A Menu

Embedded Src 12      Auto (2048)         ↑PgUp
Embedded Src 34      Auto (2048)             *
Audio PID                                    *
                                          Quit
```

[9] Clip Level was shown as Gain on versions 3.0 – 3.2

Coding Standard = Linear PCM and Dolby E



NOTE...

Problems may be experienced with some Receivers if the Encoder and Decoder are not using the same version of SMPTE 310M specification, e.g. 1998 or 2000. The Encoder can be set to work in either standard.

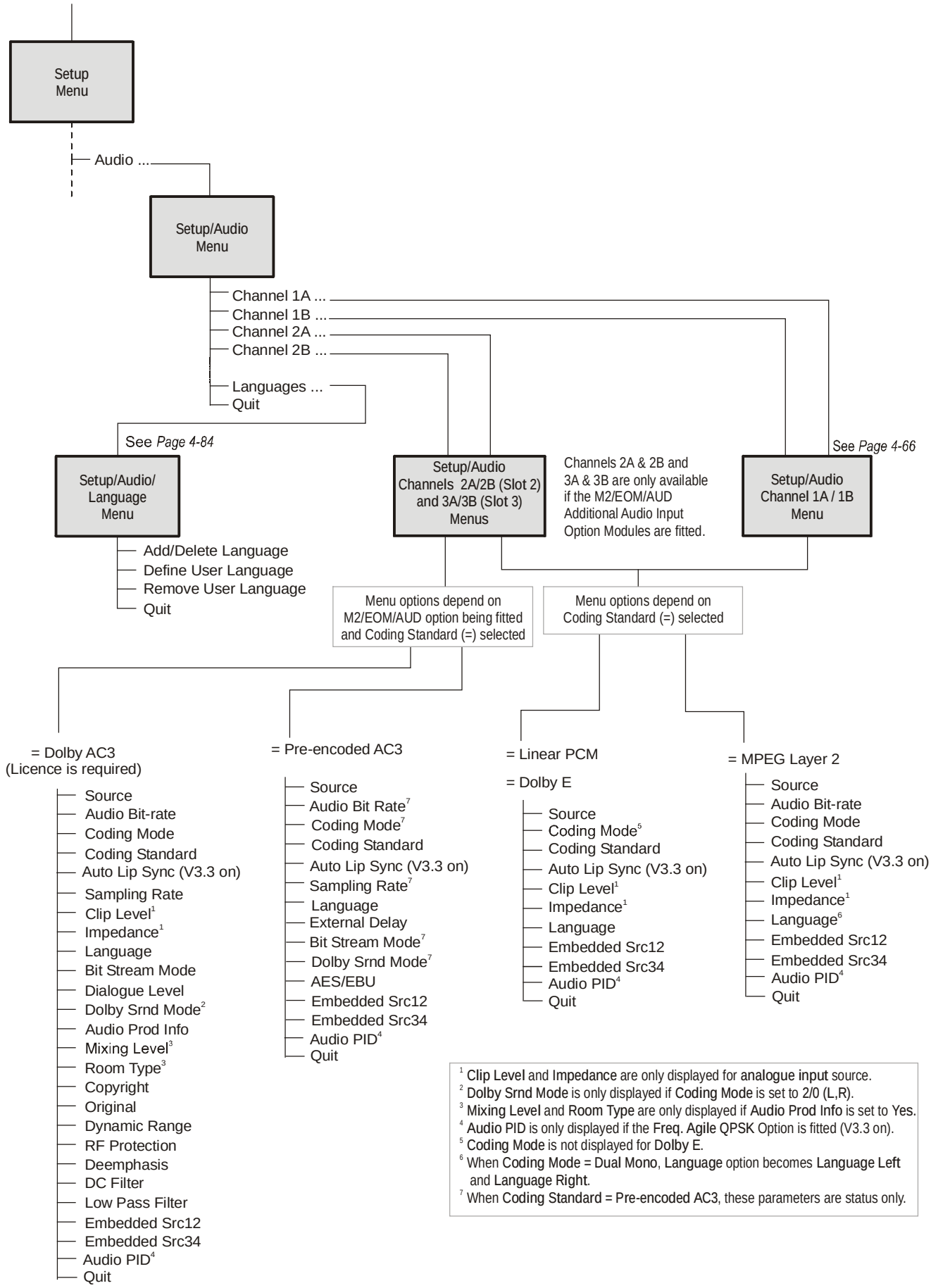


Figure 4.11: Menu Hierarchy – Setup/Audio Menu

Source Option

To access the Source option, press the **Source** softkey in the `Channel 1A Menu`.

```
Setup/Audio 1A Edit

Audio Source                                    +
                        Analogue                –
                                            Enter
Update using softkeys                        Quit
```

Table 4.54: Source Options

Selected Option	Description	Pre-encoded AC3	MPEG Layer 2	Dolby E	Linear PCM	Dolby AC3
Off	No audio packets are sent in the transport stream and audio is removed from the SI.	This requires a licence and option fitted	✓	✓	✓	This requires a licence and option fitted
Mute	Empty audio packets are sent in the transport stream.		✓		✓	
Test Tone	The internal test tone is used as the audio source.		✓		✓	
Analogue	Analogue audio input on AUDIO IN connector.		✓		✓	
Digital 1	Digital audio input 1 on AUDIO IN connector.		✓	✓	✓	
Digital 2	Digital audio input 2 on AUDIO IN connector.		✓	✓	✓	
SDI Embedded 1	Digital audio de-embedded from digital video input using DID 0x2FF.		✓	✓	✓	
SDI Embedded 2	Digital audio de-embedded from digital video input using DID 0x1FD.		✓	✓	✓	
SDI Embedded 3	Digital audio de-embedded from digital video input using DID 0x1FB.		✓	✓	✓	
SDI Embedded 4	Digital audio de-embedded from digital video input using DID 0x2F9.		✓	✓	✓	

Audio Bit-rate Option

To access the Audio Bit-rate option, press the **Audio Bit-rate** softkey in the `Channel 1A Menu`.

```
Setup/Audio 1A Edit

Audio Bit-rate                                  +
                        384 kbit/s              –
                                            Enter
Update using softkeys                        Quit
```

Table 4.55: Audio Bit-rate Options

Available Settings	MPEG Layer 2 Coding				Dolby Digital	
	Mono	Dual Mono	Stereo	Joint Stereo	1/0(C)	2/0(L,R)
32 kbit/s	✓	×	×	×	×	×
48 kbit/s	✓	×	×	×	×	×
56 kbit/s	✓	×	×	×	✓	×
64 kbit/s	✓	✓	✓	✓	✓	×
80 kbit/s	✓	×	×	×	✓	×
96 kbit/s	✓	✓	✓	✓	✓	✓
112 kbit/s	✓	✓	✓	✓	✓	✓
128 kbit/s	✓	✓	✓	✓	✓	✓
160 kbit/s	✓	✓	✓	✓	✓	✓
192 kbit/s	✓	✓	✓	✓	✓	✓
224 kbit/s	×	✓	✓	✓	✓	✓
256 kbit/s	×	✓	✓	✓	✓	✓
320 kbit/s	×	✓	✓	✓	✓	✓
384 kbit/s	×	✓	✓	✓	✓	✓
448 kbit/s	×	×	×	×	✓	✓
512 kbit/s	×	×	×	×	✓	✓
576 kbit/s	×	×	×	×	✓	✓
640 kbit/s	×	×	×	×	✓	✓

Coding Mode Option

To access the Coding Mode option, press the **Coding Mode** softkey in the `Channel 1A Menu`. If the current audio bit-rate is outside the bit-rate range supported by the new coding mode, the bit-rate is changed automatically to the lowest value within the supported range.

> NOTE...
> Coding Mode is not displayed when Coding Standard is set to Dolby E.

```
Setup/Audio 1A Edit

Audio Coding Mode                                        +
                       Stereo                            –
                                                     Enter
Update using softkeys                                 Quit
```

Table 4.56: Coding Mode Options

Selected Option	Description	Coding Standard				
		MPEG Layer 2	Linear PCM	Dolby AC3	Pre-encoded AC3	Audio Desc
Mono	Single channel mono audio coding.	✓	✖	✖	✖	✓
Stereo	Dual channel stereo audio coding.	✓	✓	✖	✖	✖
Joint Stereo	Dual channel joint (intensity) stereo audio coding.	✓	✖	✖	✖	✖
Dual Mono	Dual channel mono audio coding.	✓	✓	✖	✖	✖
1/0(C)	Single channel mono audio coding.	✖	✖	✓	✓	✖
2/0(L,R)	Dual channel stereo audio coding.	✖	✖	✓	✓	✖
3/0(L,C,R)	These modes are passed through the Encoder as part of the pre-encoded AC3 transport stream.	✖	✖	✖	✓	✖
2/1(L,R,S)		✖	✖	✖	✓	✖
3/1(L,C,R,S)		✖	✖	✖	✓	✖
2/2(L,R,Ls,Rs)		✖	✖	✖	✓	✖
3/2(L,C,R,Ls,Rs)		✖	✖	✖	✓	✖

NOTE...
Audio Desc is only available in Mono modes and bit-rates of 32 kbit/s to 192 kbit/s.

Coding Standard Option

To access the Coding Standard option, press the **Coding Standard** softkey in the Channel 1A Menu.

```
Setup/Audio 1A Edit

Audio Coding Standard                          +
                      MPEG Layer 2             –
                                             Enter
Update using softkeys                         Quit
```

Table 4.57: Coding Standard Options

Selected Option	Description	Comments
MPEG-1 Layer 2	MPEG Layer 2 audio coding standard.	
Dolby AC3	Dolby Digital AC-3 audio coding standard.	Requires a licence and the M2/EOM/AUD option.
Dolby E	Dolby E audio coding standard.	
Pre-encoded AC3	Pre-encoded AC-3 audio coding standard.	Requires a licence and the M2/EOM/AUD option.
Linear PCM	Linear PCM audio coding standard.	

Auto Lip Sync (V3.3 on)

To access the Auto Lip Sync option, press the **Auto Lip Sync** softkey in the Channel 1A Menu and select either ON or OFF as required.
See *page 4-14* for use of this facility.

```
Setup/Audio 1A Edit

Auto Lip Sync                                    +
                      On                         –
                                               Enter
Update using softkeys                           Quit
```

Sampling Rate Option

To access the Sampling Rate option, press the **Sampling Rate** softkey in the Channel 2A Menu. This enables the required sampling frequency.

> NOTE...
> Sampling Rate is only displayed when Coding Standard = Dolby AC-3. This requires a licence (refer to Customer Services) and option module M2/EOM/AUD to be fitted. This menu item is not available in Channel 1A or 1B.

```
Setup/Audio 2A Edit

Sampling Rate                                    +
                      44.1 kHz                   –
                                               Enter
Update using softkeys                           Quit
```

Table 4.58: Sampling Rate Options

Selected Option	Description
32 kHz	
44.1 kHz	Only used in Dolby AC-3.
48 kHz	

Clip Level Option

To access the Clip Level option, press the **Clip Level** softkey in the Channel 1A Menu. This screen enables the audio clipping level to be set.

> NOTE...
> Clip Level is only displayed for analogue sources.

```
Setup/Audio 1A Edit

Clip Level                                       +
                      12 dB                      –
                                               Enter
Update using softkeys                           Quit
```

Table 4.59: Clip Level Options (Source = Analogue)

Selected Option	Description
12 dB	12 dB audio clipping level.
18 dB	18 dB audio clipping level.

Impedance Option

To access the Impedance option, press the **Impedance** softkey in the Channel 1A Menu. This screen enables the impedance of the audio input to be set.

> NOTE...
> The Impedance option is only displayed for analogue sources.

```
Setup/Audio 1A Edit

Audio Impedance                                    +
                        600 Ohms                   –
                                                 Enter
Update using softkeys                             Quit
```

Table 4.60: Impedance Options

Selected Option	Description
600 Ohms	Used in analogue mode.
20K Ohms	

Language Option

To access the Language option, press the **Language** softkey in the Channel 1A Menu. This enables the language of the audio channel to be indicated.

```
Setup/Audio 1A Edit

Audio Language                                     +
                        English                    –
                                                 Enter
Update using softkeys                             Quit
```

If the **Coding Mode** is set to **Dual Mono** then the language screen is allows separate entry of the language for left and right channels.

Bit Stream Mode Option

To access the Bit Stream Mode option, press the **Bit Stream Mode** softkey in the Channel 2A Menu. This indicates the type of service the bit-stream conveys.

> NOTE...
>
> The Bit Stream Mode option is only displayed when Coding Standard = Dolby AC-3. This requires a licence (refer to Customer Services) and option module M2/EOM/AUD to be fitted. This menu item is not available in Channel 1A or 1B.

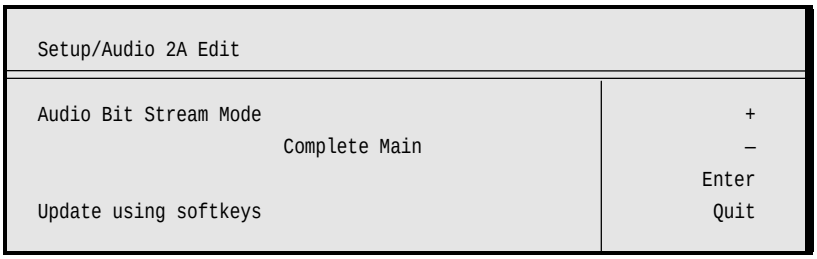


Table 4.61: Bit Stream Mode Options

Selected Option	Description
Complete Main	
Music and Effects	
Visually Impaired	
Hearing Impaired	
Dialogue	
Commentary	
Emergency	
Voice Over/Karaoke	In Dolby Digital when the coding mode is 1/0 this option appears as “Voice Over” otherwise as “Karaoke”.

Dialogue Level Option

To access the Dialogue Level option, press the **Dialogue Level** softkey in the Channel 2A Menu. The value of the Dialogue Level affects the sound reproduction level and indicates how far the average dialogue level of the encoded program is below digital 100%.

> NOTE...
>
> The Dialogue Level option is only displayed when Coding Standard = Dolby AC-3. This requires a licence (refer to Customer Services) and option module M2/EOM/AUD to be fitted. This menu item is not available in Channel 1A or 1B.

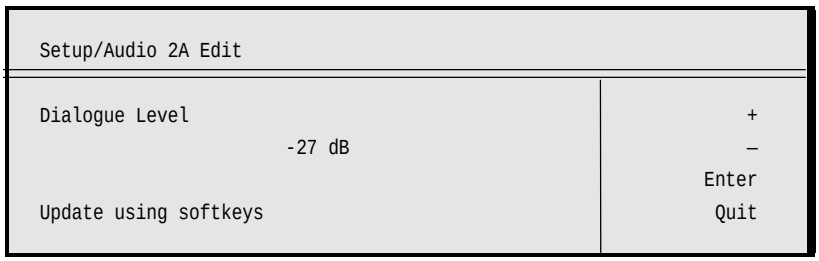


Table 4.62: Dialogue Level Options

Selected Option	Description
–1 dB to –31 dB	Dialogue levels between –1 dB to –31 dB.

Dolby Srnd Mode Option

To access the Dolby Srnd Mode option, press the **Dolby Srnd Mode** softkey in the Channel 2A Menu. This indicates whether a two-channel Dolby AC-3 bit-stream is conveying a Dolby Surround encoded program.

NOTES...

7. The Dolby Srnd Mode option is only displayed when Coding Standard = Dolby AC-3. This requires a licence (refer to Customer Services) and option module M2/EOM/AUD to be fitted. This menu item is not available in Channel 1A or 1B.
8. This parameter appears in the bit-stream only when operating in the two channel mode (Audio Coding Mode = 2/0 L,R).

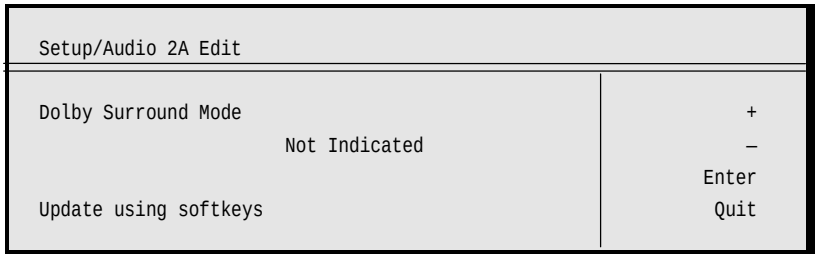


Table 4.63: Dolby Srnd Mode Options

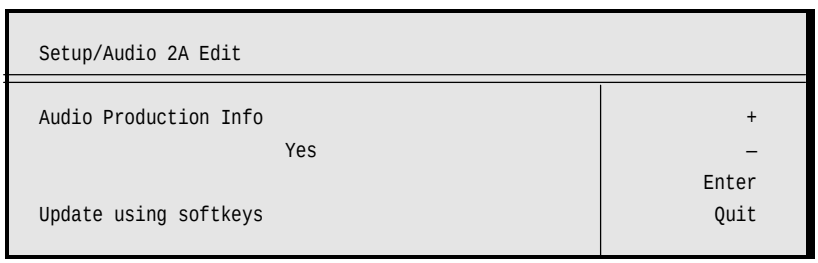
Selected Option	Description
Not Indicated	
Not Dolby Surround	
Dolby Surround	

Audio Prod Info Option

To access the Audio Prod Info option, press the **Audio Prod Info** softkey in the Channel 2A Menu. This indicates whether the Mixing Level and Room Type parameters exist within the bit-stream.

NOTE...

The Audio Prod Info option is only displayed when Coding Standard = Dolby AC-3. This requires a licence (refer to Customer Services) and option module M2/EOM/AUD to be fitted. This menu item is not available in Channel 1A or 1B.



Mixing Level Option

To access the Mixing Level option, press the **Mixing Level** softkey in the Channel 1A Menu. This parameter indicates the acoustic sound pressure level of the dialog level during the final audio mixing session.

> NOTE...
>
> This parameter appears in the bit-stream only when Coding Standard = Dolby AC-3 and the Audio Production Information parameter is set to On.

```
Setup/Audio 1A Edit

Mixing Level                                    +
                      25 dB                     –
                                              Enter
Update using softkeys                          Quit
```

Table 4.64: Mixing Level Options

Selected Option	Description
0 dB to 31 dB	Mixing levels between 0 dB to 31 dB.

Room Type Option

To access the Room Type option, press the **Room Type** softkey in the Channel 2A Menu. This parameter indicates the type and calibration of the mixing room used for the final audio mixing session.

> NOTES...
>
> 9. The Room Type option is only displayed when Coding Standard = Dolby AC-3. This requires a licence (refer to Customer Services) and option module M2/EOM/AUD to be fitted. This menu item is not available in Channel 1A or 1B.
> 10. This parameter appears in the bit-stream only when the Audio Production Information parameter is set to On.

```
Setup/Audio 2A Edit

Room Type                                       +
                      Not Indicated             –
                                              Enter
Update using softkeys                          Quit
```

Table 4.65: Room Type Options

Selected Option	Description
Not Indicated	
Small, Flat Mon	Type and calibration of the mixing room used
Large, X Curve Mon	for the final audio mixing session.

Copyright Option

To access the Copyright option, press the **Copyright** softkey in the Channel 2A Menu. This indicates whether the information in the bit-stream is shown to be protected by copyright.

> NOTE...
>
> The Copyright option is only displayed when Coding Standard = Dolby AC-3. This requires a licence (refer to Customer Services) and option module M2/EOM/AUD to be fitted. This menu item is not available in Channel 1A or 1B.

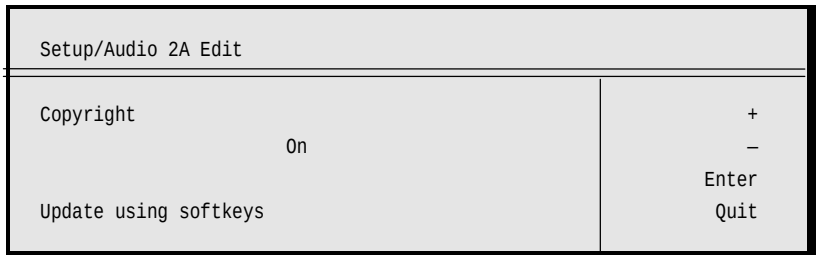


Table 4.66: Copyright Options

Selected Option	Description
On	The information in the bit-stream is indicated to be protected by copyright.
Off	The information in the bit-stream is indicated not to be protected by copyright.

Original Option

To access the Original option, press the **Original** softkey in the Channel 2A Menu. This indicates whether the bit-stream is an original or a copy of an original bit-stream.

> NOTE...
>
> The Original option is only displayed when Coding Standard = Dolby AC-3. This requires a licence (refer to Customer Services) and option module M2/EOM/AUD to be fitted. This menu item is not available in Channel 1A or 1B.

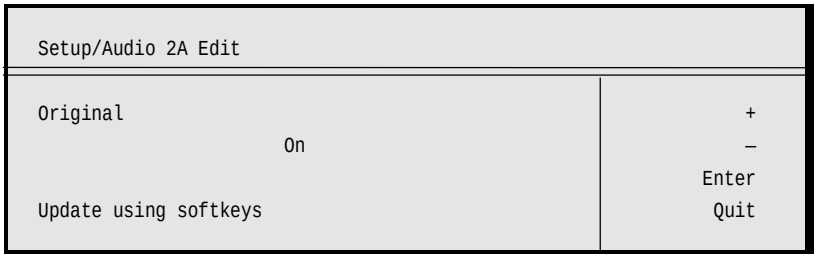


Table 4.67: Original Options

Selected Option	Description
On	The bit-stream is an original.
Off	The bit-stream is a copy of an original bit-stream.

Dynamic Range Option

To access the Dynamic Range option, press the **Dynamic Range** softkey in the Channel 2A Menu. This determines the characteristic curve of the dynamic range compression algorithm.

> NOTE...
>
> The Dynamic Range option is only displayed when Coding Standard = Dolby AC-3. This requires a licence (refer to Customer Services) and option module M2/EOM/AUD to be fitted. This menu item is not available in Channel 1A or 1B.

Table 4.68: Dynamic Range Options

Selected Option	Description
None/Custom	Program reproduction with the original dynamic range.
Film Standard	
Film Light	
Music Standard	
Music Light	
Speech	

RF Protection Option

To access the RF Protection option, press the **RF Protection** softkey in the Channel 2A Menu.

> NOTE...
>
> The RF Protection option is only displayed when Coding Standard = Dolby AC-3. This requires a licence (refer to Customer Services) and option module M2/EOM/AUD to be fitted. This menu item is not available in Channel 1A or 1B.

RF Overmodulation Protection is used in situations where the audio signal of a decoded AC-3 bit-stream is delivered via a link with very restricted dynamic range. One example is the case of a television broadcast, where sound is modulated onto an RF channel and delivered to a low cost television receiver.

In this situation it is necessary to restrict the maximum peak output level to a known value with respect to dialogue level, in order to prevent overmodulation.

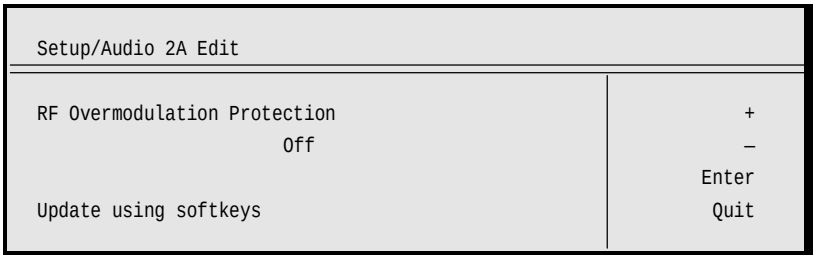


Table 4.69: RF Protection Options

Selected Option	Description
On	RF Overmodulation Protection enabled.
Off	RF Overmodulation Protection disabled.

Deemphasis Option

To access the Deemphasis option, press the **Deemphasis** softkey in the Channel 2A Menu. This parameter is used to de-emphasise the pre-emphasised audio.

> NOTE...
>
> The Deemphasis option is only displayed when Coding Standard = Dolby AC-3. This requires a licence (refer to Customer Services) and option module M2/EOM/AUD to be fitted. This menu item is not available in Channel 1A or 1B.

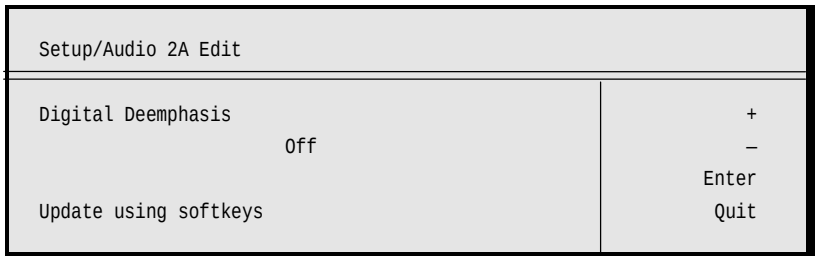


Table 4.70: Deemphasis Options

Selected Option	Description
On	Deemphasis is on.
Off	Deemphasis is off.

DC Filter Option

To access the DC Filter option, press the **DC Filter** softkey in the Channel 2A Menu. This parameter is used to activate a dc high-pass filter for all input channels.

> NOTE...
>
> DC Filter Option is only displayed when Coding Standard = Dolby AC-3. This requires a licence (refer to Customer Services) and option module M2/EOM/AUD to be fitted. This menu item is not available in Channel 1A or 1B.

```
Setup/Audio 2A Edit

DC High Pass Filter                                    +
                        On                             –
                                                     Enter
Update using softkeys                                Quit
```

Table 4.71: DC Filter Options

Selected Option	Description
On	A dc high-pass filter is activated for all input channels.
Off	A dc high-pass filter is not activated.

Low Pass Filter Option

To access the Low Pass Filter option, press the **Low Pass Filter** softkey in the Channel 2A Menu. This parameter is used to activate a low pass filter with a cut-off near the specified audio bandwidth that is applied to the main input channels.

> NOTE...
> The Low Pass Filter option is only displayed when Coding Standard = Dolby AC-3. This requires a licence (refer to Customer Services) and option module M2/EOM/AUD to be fitted. This menu item is not available in Channel 1A or 1B.

```
Setup/Audio 2A Edit

Low Pass Filter                                        +
                        On                             –
                                                     Enter
Update using softkeys                                Quit
```

Table 4.72: Low Pass Filter Options

Selected Option	Description
On	A low pass filter is selected.
Off	A low pass filter is not selected.

Embedded Src 12 Option

To access the Embedded Src 12 option, press the **Embedded Src 12** softkey in the Channel 1A Menu.

```
Setup/Audio 1A Edit

Embedded Audio Source 1 - 2                            +
                        Auto (2048)                    –
                                                     Enter
Update using keypad or softkeys                      Quit
```

Table 4.73: Embedded Src 12 Options

Selected Option	Description
Auto (2048)	

Embedded Src 34 Option

The Embedded Src 34 option is selected from the Channel 1A Menu by pressing the **Embedded Src 34** softkey. The Embedded Src 34 option has the same choices as the Embedded Src 12 option.

External Delay Option

To access the External Delay option, press the **External Delay** softkey in the Channel 2A Menu. This parameter is used to compensate for external delays.

> NOTE...
>
> The External Delay option is only displayed when Coding Standard = Dolby AC-3. This requires a licence (refer to Customer Services) and option module M2/EOM/AUD to be fitted. This menu item is not available in Channel 1A or 1B.

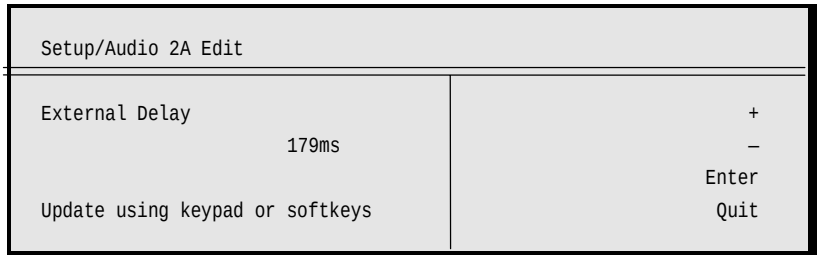


Table 4.74: External Delay Options

Valid Input Range	Description
Min: 111 ms Max: 3000 ms	

AES/EBU Output Option

To access the AES/EBU Output option, press the **AES/EBU Output** softkey in the Channel 2A Menu. This parameter allows the Encoder to generate an AES/EBU (48 kHz) output signal to enable an external audio Encoder to genlock to the E5210/E5410/E5610[/48V], see *Chapter 3, Section 3.3 Additional Audio Option (M2/EOM/AUD*).

> NOTE...
>
> The AES/EBU Output option is only displayed when Coding Standard = Dolby AC-3. This requires a licence (refer to Customer Services) and option module M2/EOM/AUD to be fitted. This menu item is not available in Channel 1A or 1B.

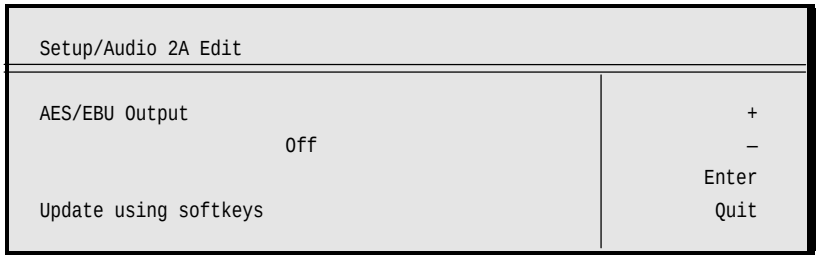


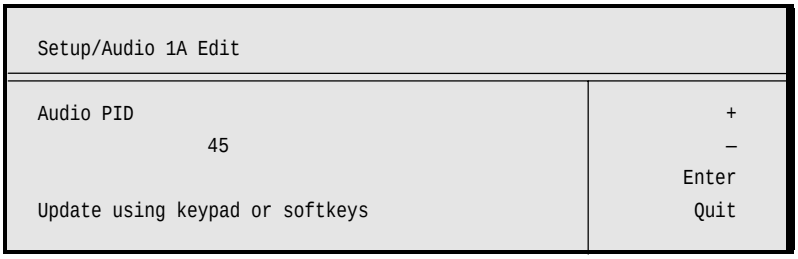
Table 4.75: AES/EBU Output Options

Selected Option	Description
On	Permits the generation of an AES/EBU (48 kHz) output signal.
Off	Does not permit the generation of an AES/EBU (48 kHz) output signal.

Audio PID Option (V3.3 on)

> NOTE...
> The Audio PID option is only displayed if the M2/EOM/QPSK2 Frequency Agile QPSK Option Module is fitted.

The Audio PID option is selected from the Channel 1A Menu by pressing the **Audio PID** softkey. The option is used for entering or updating audio PIDs, as required. Enter a PID using the keypad, then press the **Enter** softkey to enter it (see *page 3-8, Allocating PIDs*).

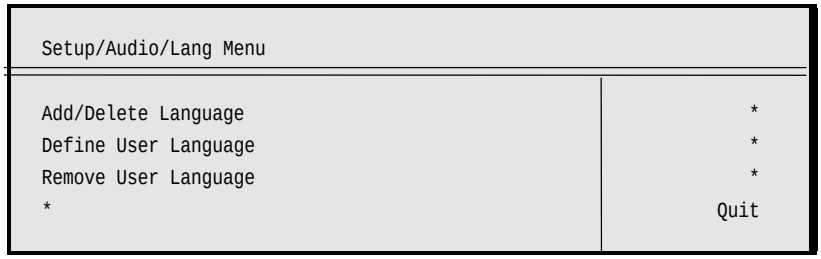


4.5.3 Language Menu

Overview

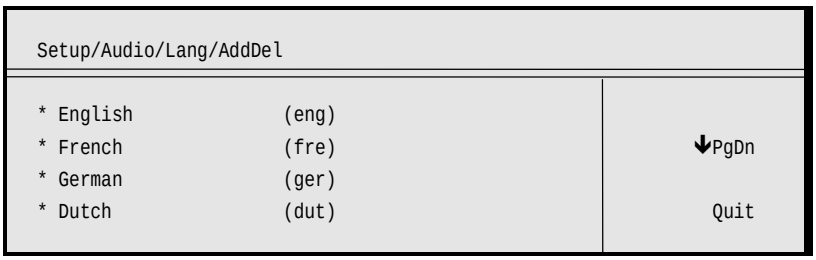
The Languages Menu is selected from the Audio Menu by pressing the **Languages** softkey.

This menu permits the selection of languages used in the MPEG broadcast.



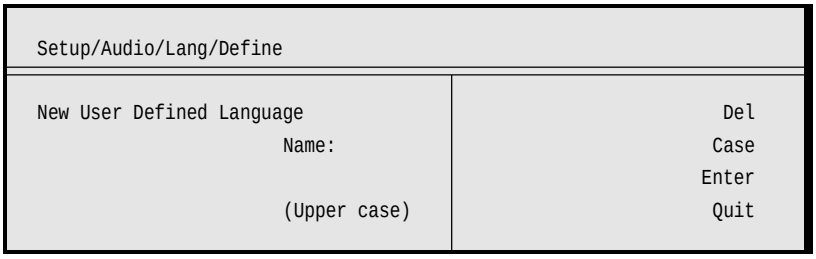
Add/Delete Language Option

To add/delete a language press the **Add/Delete Language** softkey in the Languages Menu. There are over forty languages listed.



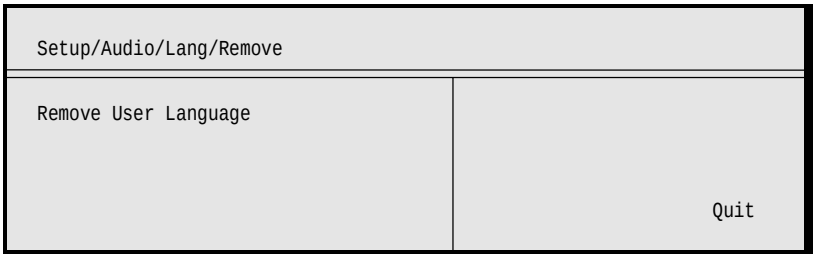
Define User Language Option

To define a user language press the **Define User Language** softkey in the Languages Menu.



Remove User Language Option

To remove a language press the **Remove Language** softkey in the Languages Menu.



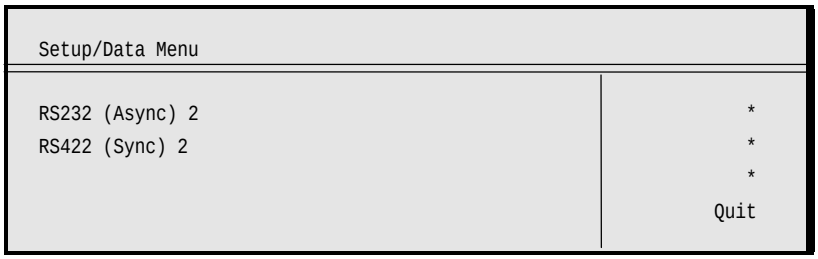
If there are no user defined languages to remove then an error screen appears with the message ‘No user defined languages’.

4.6 M2/EOM/DAT RS-232 and RS-422 Data Input Option Module Menus

4.6.1 Overview

These menus are only available if the M2/EOM/DAT RS-232 and RS-422 Data Input Option Module is fitted (see *Section 3.4*). The Data Menu is selected from the Setup Menu by pressing the **Data** softkey.

This menu provides access to further sub-menus for setting the RS-232 asynchronous and RS-422 synchronous data channel parameters.



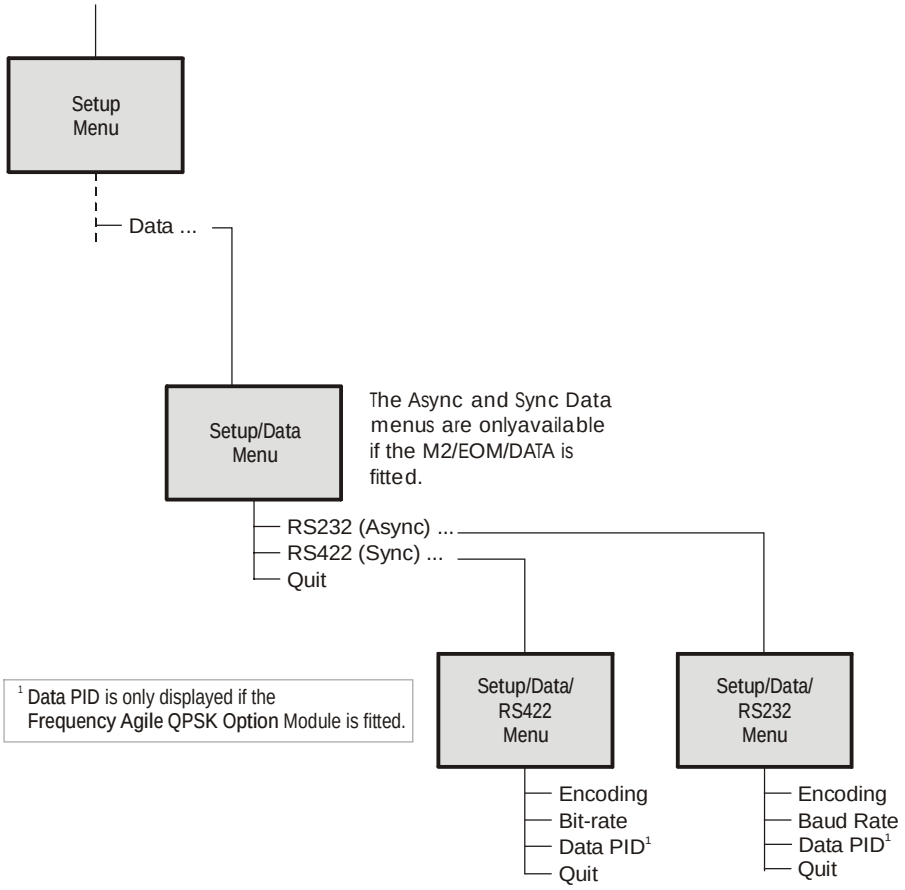


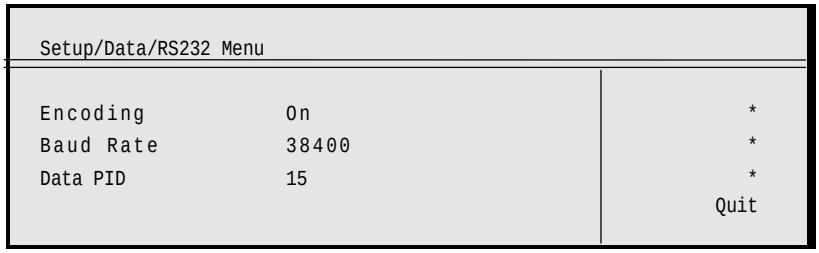
Figure 4.12: Menu Hierarchy – Setup/Data Menu

4.6.2 RS232 (Async) Menu

Top-level Menu

The RS232 (Async) Menu is selected from the Data Menu by pressing the **RS232 (Async)** softkey.

This menu provides options for setting the RS-232 asynchronous data channel parameters.



Encoding Option

To access the Encoding option, press the **Encoding** softkey in the RS232 (Async) Menu. This enables the RS-232 asynchronous data channel to be switched on or off.

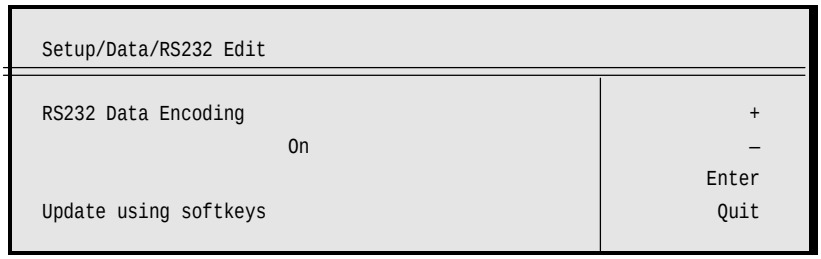


Table 4.76: Encoding Options

Selected Option	Description
On	The RS-232 asynchronous data channel is switched on.
Off	The RS-232 asynchronous data channel is switched off.

Baud Rate Option

To access the Baud Rate option, press the **Baud Rate** softkey in the RS232 (Async) Menu. This enables the Baud rate of the RS-232 asynchronous data channel to be set.

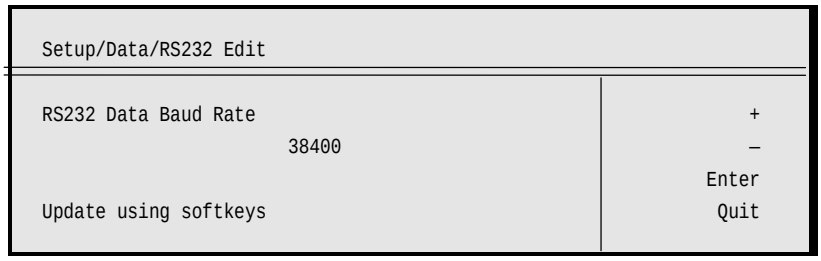


Table 4.77: Baud Rate Options

Selected Option	Description
1200	1200 Baud rate.
2400	2400 Baud rate.
4800	4800 Baud rate.
9600	9600 Baud rate.
19200	19200 Baud rate.
38400	38400 Baud rate.

Data PID Option (V3.3 on)

The Data PID option is selected from the `RS232 (Async) Menu` by pressing the **Data PID** softkey. The option is used for entering or updating data PIDs, as required. Enter a PID using the keypad, then press the **Enter** softkey to enter it (see *Section 3.5.2, Allocating PIDs*).

> NOTE...
> Data PID is only displayed when the M2/EOM/QPSK2 Frequency Agile QPSK Modulator Option is fitted.

```
Setup/Data/RS232 Menu
---------------------------------------------------------
Data PID                                        +
               64                               –
                                            Enter
Update using keypad or softkeys              Quit
```

4.6.3 RS422 (Sync) Menu

Top-level Menu

The `RS422 (Sync) Menu` is selected from the `Data Menu` by pressing the **RS422 (Sync)** softkey. This menu provides options for setting the RS-422 synchronous data channel parameters.

```
Setup/Data/RS422 Menu
---------------------------------------------------------
Encoding          On                                *
Bit-rate          56 kbit/s                         *
*                                                   *
*                                                Quit
```

Encoding Option

To access the Encoding option, press the **Encoding** softkey in the RS422 (Sync) Menu. This enables the RS-422 synchronous data channel to be switched on or off.

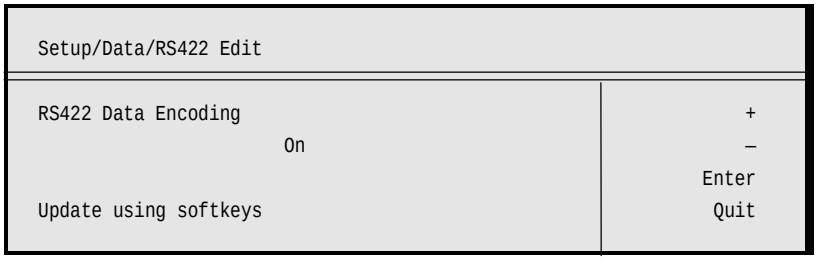


Table 4.78: Encoding Options

Selected Option	Description
On	The RS-422 synchronous data channel is switched on.
Off	The RS-422 synchronous data channel is switched off.

Bit-rate Option

To access the Bit-rate option, press the **Bit-rate** softkey in the RS422 (Sync) Menu. This enables the bit-rate of the RS-422 synchronous data channel to be set.

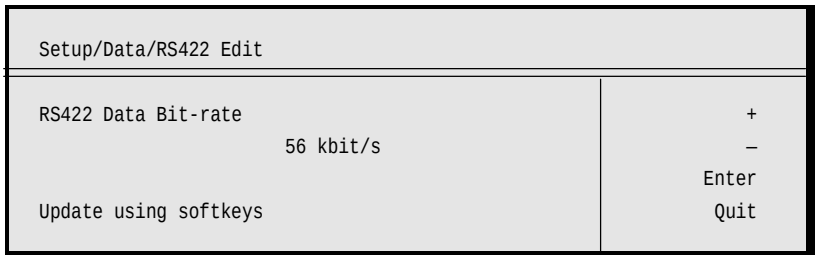


Table 4.79: Bit-rate Options

Selected Option	Description
Settings cycle from 56 to 1792 in steps of 56 then from 64 to 2048 in steps of 64, then back to 56	RS-422 synchronous data channel bit-rate.

Data PID Option (V3.3 on)

The Data PID option is selected from the RS422 (Sync) Menu by pressing the **Data PID** softkey. See Data PID Option on *page 4-88* for an explanation.

> NOTE...
> Data PID is only displayed when the M2/EOM/QPSK2 Frequency Agile QPSK Modulator Option is fitted.

4.7 M2/EOM/QPSK2 Frequency Agile QPSK Modulator Option Module Menu

4.7.1 Overview

This menu is only available if the M2/EOM/QPSK2 Frequency Agile QPSK Modulator Option Module Menu is fitted (see *Section 3.5*).

> CAUTION...
>
> Changing any of the Modulator menu items will disrupt the output.

The Modulator Menu is selected from the Setup Menu by pressing the **Modulator** softkey. This menu provides options for configuring the operating parameters for the Modulator.

The screens vary according to the Modulator **Output Format** selected. This can be either IF (where the IF output is used for transmission over a satellite link), or baseband (where the DVB ASI output is used for transmission over a telecommunications link).

To access the Output Format option, press the **Output Format** softkey in the Modulator Menu. This enables the output format of the Encoder to be set.

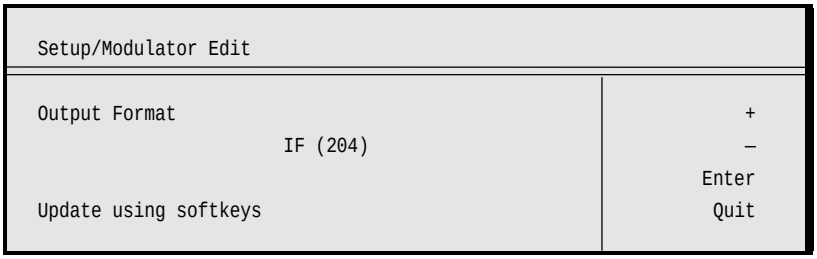


Table 4.80: Output Format Options

Selected Option	Description
IF (204)	IF output using 204 byte packets. Used for transmission over a satellite link.
Baseband (188)	Baseband output using 188 byte packets. Used for transmission over a telecommunications link.

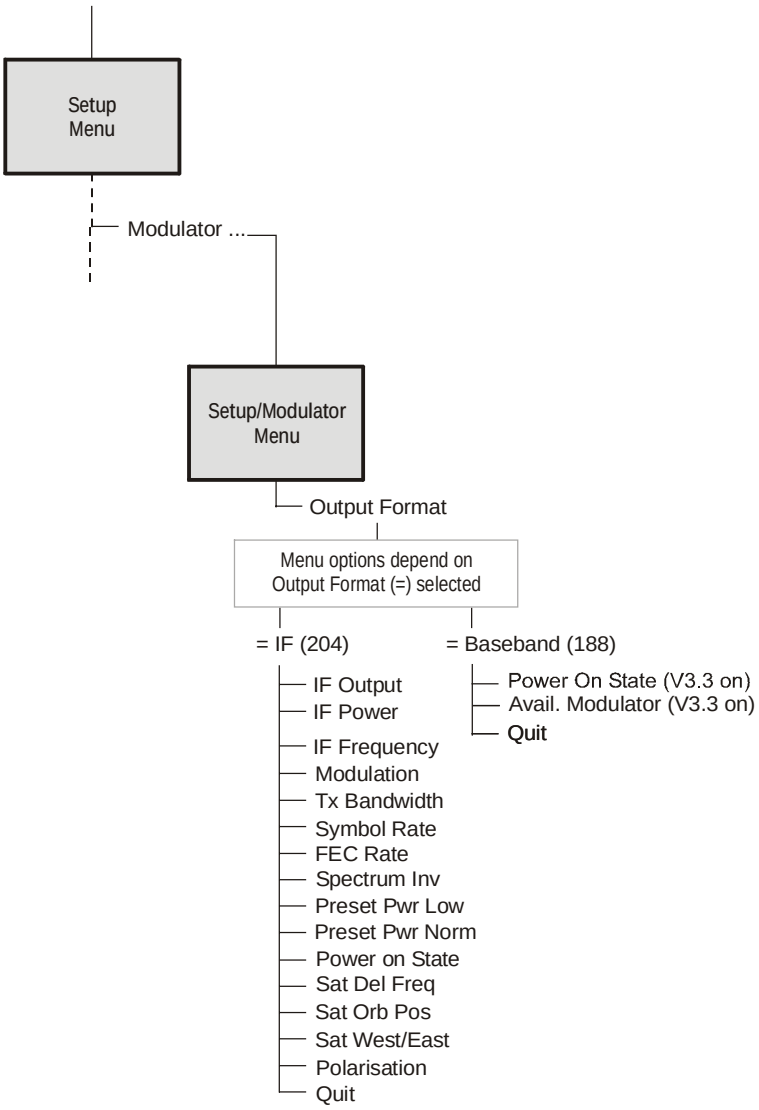


Figure 4.13: M2/EOM/QPSK2 Frequency Agile QPSK Modulator Option Module Menu

NOTES...

1. Only the 204-byte ASI output can be used with the M2/EOM/QPSK2 module. If 188 byte is selected, either ASI transmission or an external Modulator must be used.
2. Audio PID (*page 4-84*), Video PID (*page 4-57*) and Data PID (*page 4-88*) are added to the appropriate menus when this module is fitted.

4.7.2 IF (204) Output Format

Top-level Menu

```
Setup/Modulator Menu

Output Format          IF (204)                    *
IF Output              Off                      ↓PgDn
IF Power               0.0 dBm                     *
IF Frequency           60.000 MHz               Quit
```

```
Setup/Modulator Menu

Modulation          Off                          ↑PgUp
Tx Bandwidth        25.6000 MHz                  ↓PgDn
Symbol Rate         20.0000 Msym/s                 *
FEC Rate            3/4                          Quit
```

```
Setup/Modulator Menu

Spectrum Inv        Off                          ↑PgUp
Preset Pwr Low      -20.0 dBm                    ↓PgDn
Preset Pwr Norm     0.0 dBm                        *
Power On State      IF Off                       Quit
```

```
Setup/Modulator Menu

Sat Del Freq        1.000000 GHz                 ↑PgUp
Sat Orb Pos         36.8°                          *
Sat West/East       West                           *
Polarisation        Linear Horizontal            Quit
```

IF Output Option

To access the IF Output option, press the **IF Output** softkey in the Modulator Menu. This enables the IF output to be switched on or off.

```
Setup/Modulator Edit

IF Output                                          +
                    On                             –
                                                 Enter
Update using softkeys                            Quit
```

Table 4.81: IF Output Options

Selected Option	Description
On	IF output switched on.
Off	IF output switched off. When the IF output is switched off, modulation is automatically set to off and the IF power level is set to the low setting. The original settings are not restored when the IF output is switched back on.

IF Power Option

To access the IF Power option, press the **IF Power** softkey in the Modulator Menu. This screen enables the power level of the IF output to be set.

> NOTE...
>
> If the + and – softkeys are used, the power level is actually changed as the value changes on the screen (for example, keeping the + softkey pressed will result in the actual IF power level stepping up).

```
Setup/Modulator Edit

IF Power                                              +
                          0.0 dBm                     –
Update using keypad or                              Enter
softkeys for immediate changes                      Quit
```

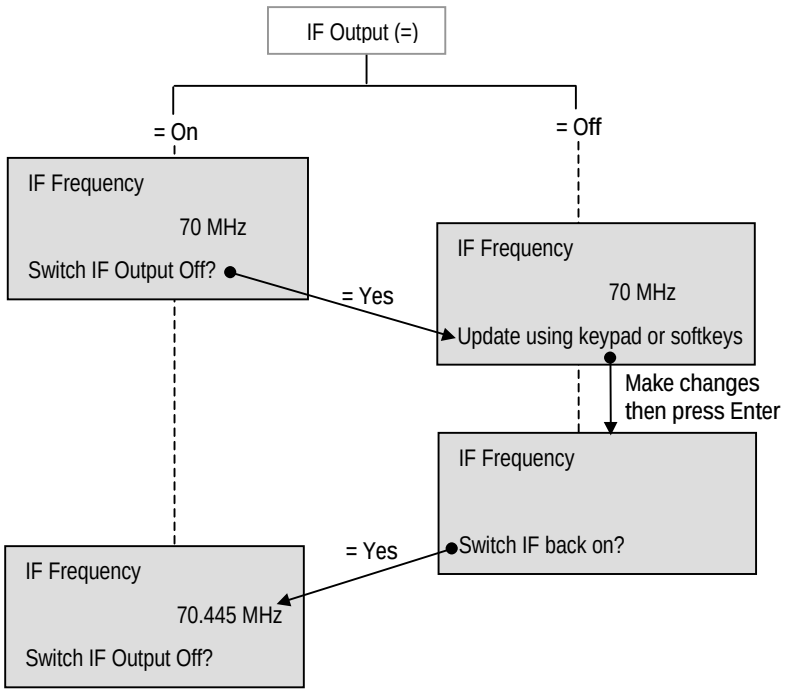
Table 4.82: IF Power Options

Valid Input Range	Description
Min: –20.0 dBm Max: 5.0 dBm Step Size: 0.1 dBm	IF output power level.

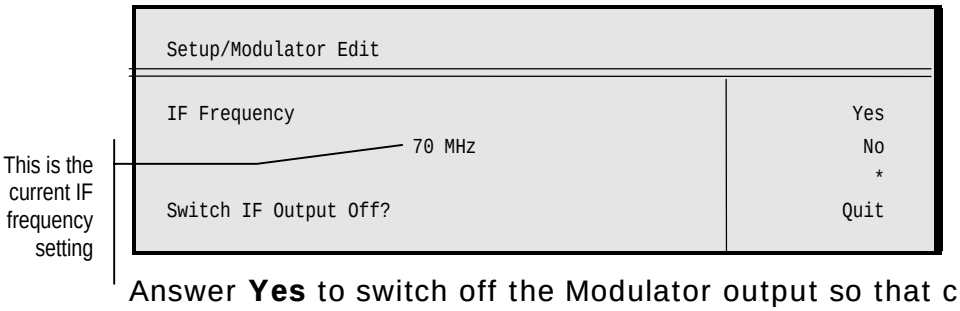
If the specified IF power level entered using the keypad is outside the valid input range, a confirmation screen is displayed which shows the maximum/minimum value allowed.

```
Confirmation Screen

IF Power
Specified Value Too High
Select <Enter> to Set to                            Enter
Maximum : 5.0 dBm                                   Quit
```

IF Frequency Option



To access the IF Frequency option, press the **IF Frequency** softkey in the Modulator Menu. This displays the following screen.



Answer **Yes** to switch off the Modulator output so that changes do not affect the output. This displays the following screen which allows the IF frequency to be set.

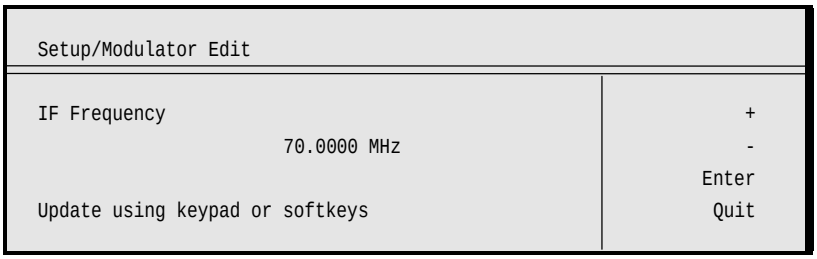
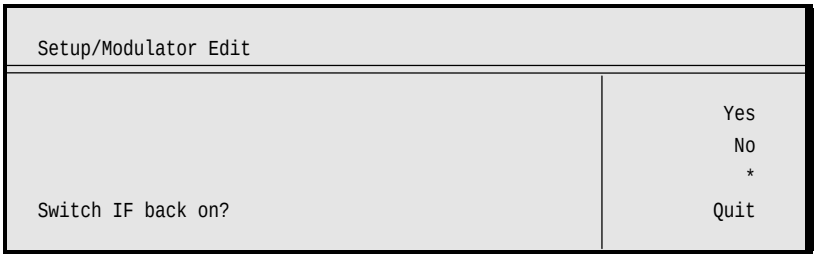


Table 4.83: IF Frequency Options

Valid Input Range		Description
Min:	60.000 MHz	IF Frequency.
Max:	80.000 MHz	
Step Size:	0.0025 MHz	

If the specified IF Frequency entered using the keypad is outside the valid input range, a confirmation screen is displayed which shows the maximum/minimum value allowed.

Entering a value for the If Frequency displays a screen to allow the IF output to be turned back on.



Modulation Option

To access the Modulation option, press the **Modulation** softkey in the Modulator Menu. This enables modulation of the IF carrier to be switched on or off.

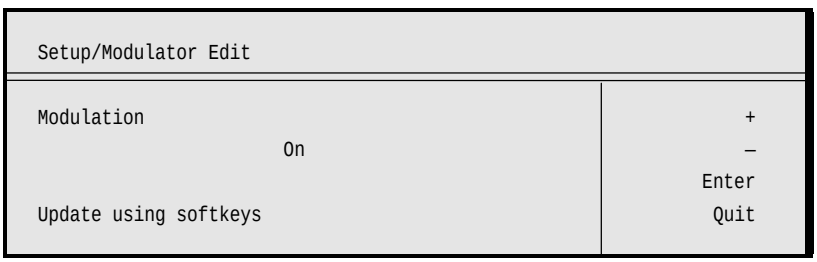


Table 4.84: Modulation Options

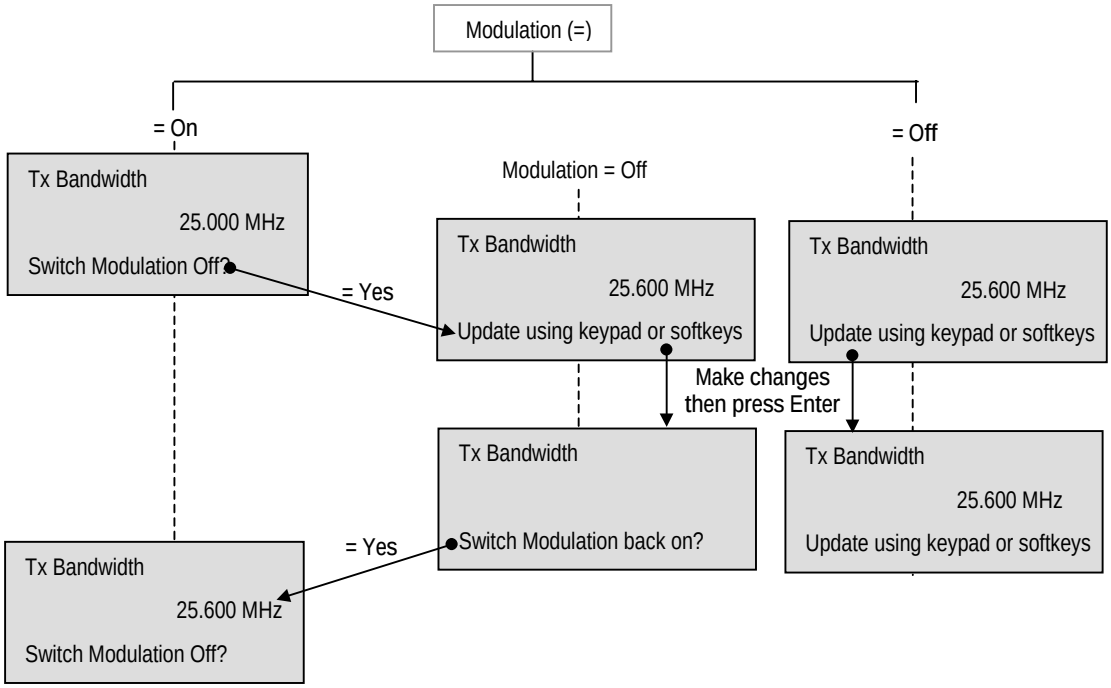
Selected Option	Description
On	Modulation switched on.
Off	Modulation switched off. Modulation is automatically set to off if the IF output is switched off, but it is not automatically switched back on when the IF output is switched back on.

Tx Bandwidth Option

Overview

To access the Tx Bandwidth option, press the **Tx Bandwidth** softkey in the `Modulator Menu`.

Pressing the **Tx Bandwidth** softkey displays one of two screens, depending on whether modulation is switched on or off when the softkey is pressed.



Modulation Switched On

The following screen is displayed. In order to change the Tx bandwidth, modulation must first be switched off. Press the **Yes** softkey to do this automatically (and proceed to the next screen), or press the **No** (or **Quit**) softkey to return to the menu.

```
Setup/Modulator Edit

Tx Bandwidth                                  Yes
                    25.6000 MHz               No
                                               *
Switch Modulation OFF?                        Quit
```

When modulation is switched off, the following screen is displayed.

Table 4.85: Tx Bandwidth Options

Valid Input Range	Description
Min: 0.600 MHz Max: 38.4000 MHz Step Size: 0.0001 MHz	Tx bandwidth. Changing the Tx bandwidth affects the automatic symbol rate, video bit-rate and video resolution calculations.

```
Setup/Modulator Edit

Tx Bandwidth                                  Yes
                    25.6000 MHz               No
                                              Enter
Update using keypad or softkeys               Quit
```

The following screen is displayed. Press the **Yes** softkey to switch modulation back on and return to the menu, or press the **No** softkey to return to the menu and leave modulation switched off.

```
Setup/Modulator Edit

Tx Bandwidth                                  Yes
                    25.7000 MHz               No
                                               *
Switch Modulation Back ON?                    Quit
```

If the specified bandwidth is outside the valid input range, a confirmation screen similar to the following is displayed which shows the maximum/minimum value allowed. Press the **Enter** softkey to accept the new value shown, or press the **Quit** softkey to leave the original bandwidth unchanged (modulation remains switched off).

```
Confirmation Screen

Tx Bandwidth
Specified Value Too High
Select <Enter> to Set to                      Enter
Maximum : 38.4000 MHz                         Quit
```

Modulation Switched Off

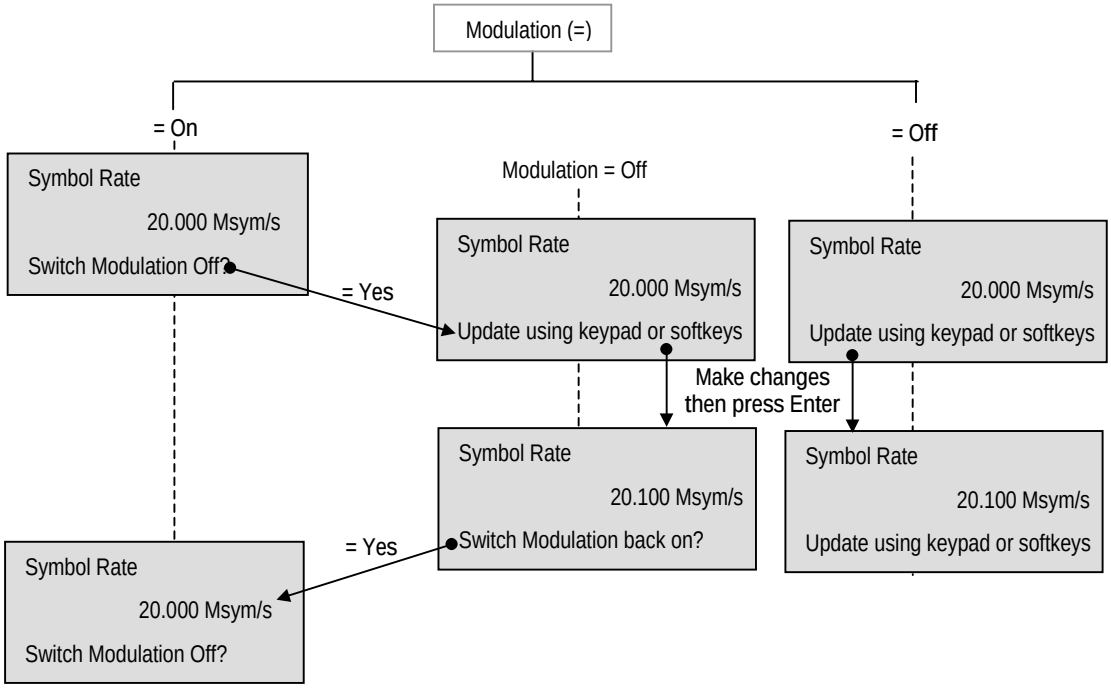
If modulation is switched off, the option is used in the same way as described for the modulation switched on, except that the screens to switch modulation off and then back on are not displayed.

Symbol Rate Option

Overview

To access the Symbol Rate option, press the **Symbol Rate** softkey in the Modulator Menu.

Pressing the **Symbol Rate** softkey displays one of two screens, depending on whether modulation is switched on or off when the softkey is pressed.



Modulation Switched On

The following screen is displayed. In order to change the symbol rate, modulation must first be switched off. Press the **Yes** softkey to do this automatically (and proceed to the next screen), or press the **No** (or **Quit**) softkey to return to the menu.

```
Setup/Modulator Edit

Symbol Rate                                    Yes
                      20.0000 Msym/s            No
                                                 *
Switch Modulation OFF?                         Quit
```

When modulation is switched off, the following screen is displayed.

Table 4.86: Symbol Rate Options

Valid Input Range	Description
Min: 0.4688 Msym/s Max: 30.0000 Msym/s Step Size: 0.0001 Msym/s	Symbol rate. Changing the symbol rate affects the automatic Tx bandwidth, video bit-rate and video resolution calculations.

```
Setup/Modulator Edit

Symbol Rate                                     +
                      20.0000 Msym/s            –
                                              Enter
Update using keypad or softkeys               Quit
```

The following screen is displayed. Press the **Yes** softkey to switch modulation back on and return to the menu, or press the **No** softkey to return to the menu and leave modulation switched off.

```
Setup/Modulator Edit

Symbol Rate                                    Yes
                      20.1000 Msym/s           No
                                               *
Switch Modulation ON?                          Quit
```

If the specified symbol rate is outside the valid input range, a confirmation screen similar to the following is displayed which shows the maximum/minimum value allowed. Press the **Enter** softkey to accept the new value shown, or press the **Quit** softkey to leave the original symbol rate unchanged (modulation remains switched off).

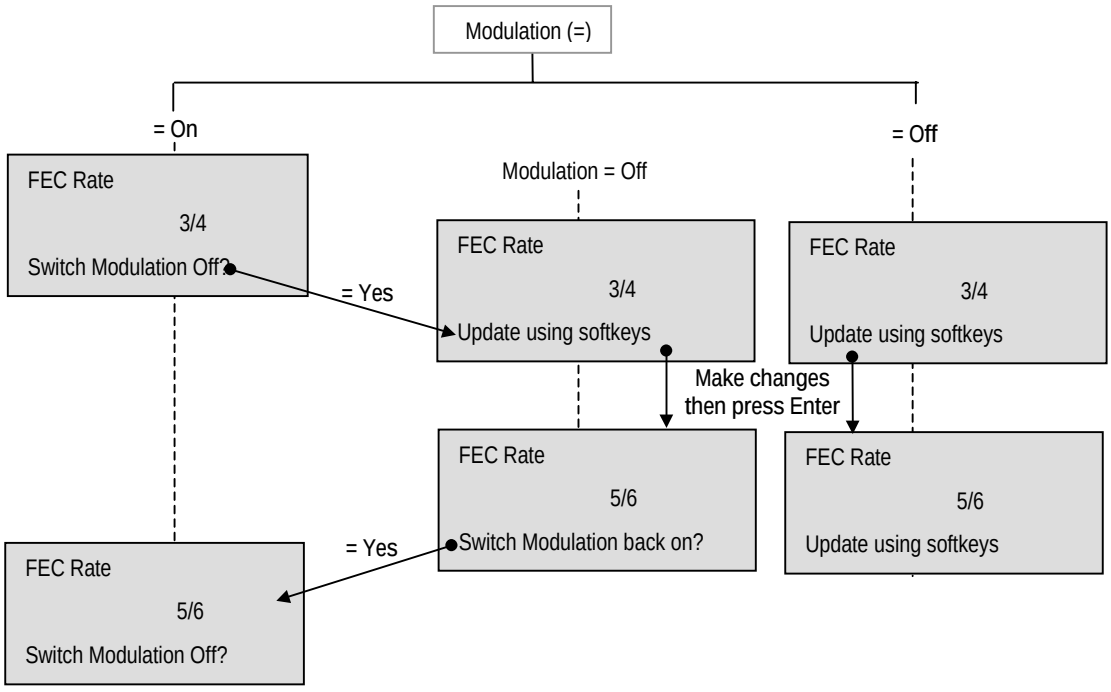
```
Confirmation Screen

Symbol Rate
Specified Value Too High
Select <Enter> to Set to                       Enter
Maximum :  37.500 Msym/s                       Quit
```

Modulation Switched Off

If modulation is switched off, the option is used in the same way as described for modulation switched on, except that the screens to switch modulation off and then back on are not displayed.

FEC Rate Option

Overview



To access the FEC Rate option, press the **FEC Rate** softkey in the Modulator Menu.

Pressing the **FEC Rate** softkey displays one of two screens, depending on whether modulation is switched on or off when the softkey is pressed.

Modulation Switched On

The following screen is displayed. In order to change the FEC rate, modulation must first be switched off. Press the **Yes** softkey to do this automatically (and proceed to the next screen), or press the **No** (or **Quit**) softkey to return to the menu.

```
Setup/Modulator Edit

FEC Rate                                    Yes
                    3/4                      No
                                              *
Switch Modulation OFF?                      Quit
```

When modulation is switched off, the screen shown below is displayed. Use the **+** and **–** softkeys to cycle through the available settings, then press the **Enter** softkey to accept the new value. Changing the FEC rate affects the automatic symbol rate, video bit-rate and video resolution calculations.

Table 4.87: FEC Rate Options

Selected Option	Description
1/2	FEC rate of 1/2.
2/3	FEC rate of 2/3.
3/4	FEC rate of 3/4.
5/6	FEC rate of 5/6.
7/8	FEC rate of 7/8.

```
Setup/Modulator Edit

FEC Rate                                     +
                    3/4                      –
                                            Enter
Update using softkeys                       Quit
```

The following screen is displayed. Press the **Yes** softkey to switch modulation back on and return to the menu, or press the **No** softkey to return to the menu and leave modulation switched off.

```
Setup/Modulator Edit

FEC Rate                                    Yes
                    3/4                      No
                                              *
Switch Modulation Back ON?                  Quit
```

Modulation Switched Off

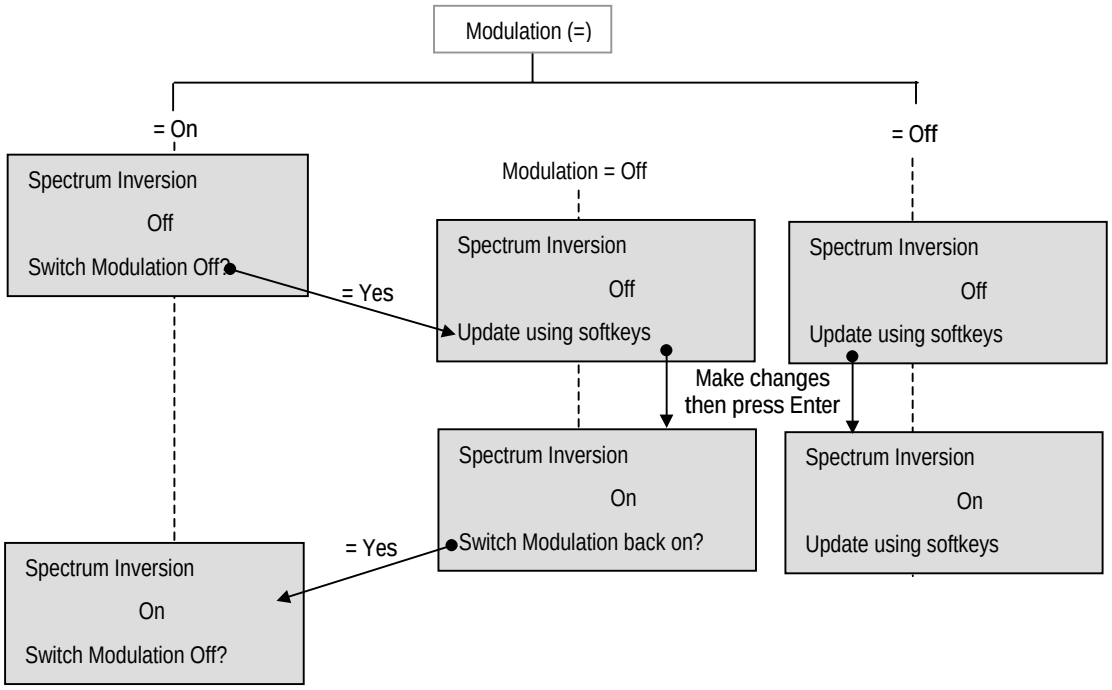
If modulation is switched off, the option is used in the same way as described for modulation switched on, except that the screens to switch modulation off and then back on are not displayed.

Spectrum Inv Option

Overview

To access the Spectrum Inv option, press the **Spectrum Inv** softkey in the Modulator Menu.

Pressing the **Spectrum Inv** softkey displays one of two screens, depending on whether modulation is switched on or off when it is pressed.



Modulation Switched On

The following screen is displayed. In order to change the spectrum inversion, modulation must first be switched off. Press the **Yes** softkey to do this automatically (and proceed to the next screen), or press the **No** (or **Quit**) softkey to return to the menu.

```
Setup/Modulator Edit

Spectrum Inversion                          Yes
                    Off                     No
                                             *
Switch Modulation OFF?                      Quit
```

When modulation is switched off, the following screen is displayed.

Table 4.88: Spectrum Inv Options

Selected Option	Description
Off	Spectrum inversion switched off.
On	Spectrum inversion switched on.

```
Setup/Modulator Edit

Spectrum Inversion                    +
                  Off                 –
                                    Enter
Update using softkeys                Quit
```

The following screen is displayed. Press the **Yes** softkey to switch modulation back on and return to the menu, or press the **No** softkey to return to the menu and leave modulation switched off.

```
Setup/Modulator Edit

Spectrum Inversion                   Yes
                  Off                 No
                                       *
Switch Modulation Back ON?           Quit
```

Modulation Switched Off

If modulation is switched off, the option is used in the same way as described for modulation switched on, except that the screens to switch modulation off and then back on are not displayed.

Preset Pwr Low Option

To access the Preset Pwr Low option, press the **Preset Pwr Low** softkey in the Modulator Menu. This enables the **low** IF output preset power level (one of the settings for the Setup/Options Menu IF Power option) to be set. Use the **+** and **–** softkeys to increment or decrement the preset power level, or enter a new value using the keypad.

Table 4.89: Preset Pwr Low Options

Valid Input Range	Description
Min: –20.0 dBm Max: 5.0 dBm Step Size: 0.1 dBm	Low IF output preset power level. (Must also be less than the 'normal' preset power level)

```
Setup/Modulator Edit

IF Preset Power - Low                 +
                  -20.0 dBm           –
                                    Enter
Update using keypad or softkeys      Quit
```

If the specified **low** preset power level entered using the keypad is outside the valid input range, or is greater than the **normal** preset power level, a confirmation screen similar to the following is displayed which shows the maximum/minimum value allowed.

```
 Confirmation Screen

IF Preset Power – Low                                  
Specified Value Too Low                                
Select <Enter> to Set to                          Enter
Minimum :  -20.0 dBm                               Quit
```

Preset Pwr Norm Option

To access the Preset Pwr Norm option, press the **Preset Pwr Norm** softkey in the Modulator Menu.

This enables the **normal** IF output preset power level (one of settings for the Setup/Options Menu IF Power option) to be set.

Table 4.90: Preset Pwr Norm Options

Valid Input Range	Description
Min: –20.0 dBm Max: 5.0 dBm Step Size: 0.1 dBm (Must also be greater than the 'low' preset power level)	Normal IF output preset power level.

```
Setup/Modulator Edit

IF Preset Power – Normal                               +
                    0.0 dBm                            –
                                                   Enter
Update using keypad or softkeys                     Quit
```

If the specified **normal** preset power level entered using the keypad is outside the valid input range, or is less than the **low** preset power level, a confirmation screen similar to the following is displayed which shows the maximum/minimum value allowed.

```
 Confirmation Screen

IF Preset Power – Normal                               
Specified Value Too High                               
Select <Enter> to Set to                          Enter
Maximum :  5.0 dBm                                 Quit
```

Power On State

To access the Power On State option, press the **Power On State** softkey in the Modulator Menu. This menu defines the Power On.

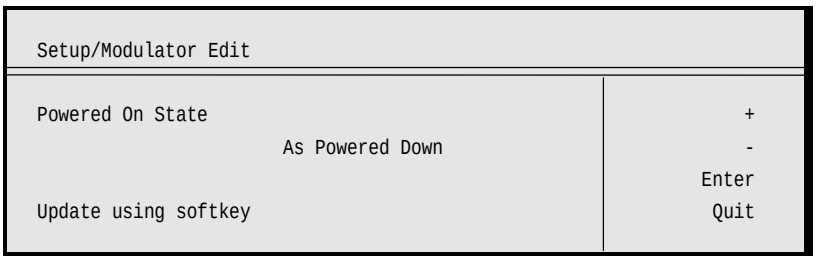


Table 4.91: Power On State Options

Selected Option	Description
As Powered Down	Refer to the following note.
IF Off	

NOTE...

If the M2/EOM/QPSK2 Frequency Agile QPSK Modulator option module is fitted, the Encoder maintains the output settings if a short power interruption (brown out) occurs.

Sat Del Freq Option

To access the Sat Del Freq option, press the **Sat Del Freq** softkey in the Modulator Menu.

This enables the receive frequency of the satellite transponder to be specified. This is included in the SI NIT if the Modulator output format is set to IF (see the Output Format option on the Setup/Modulator Menu). If the Modulator output format is set to baseband, then this option setting is ignored and the descriptors included in the NIT are those specified by the options on the Setup/System/SI Menu.

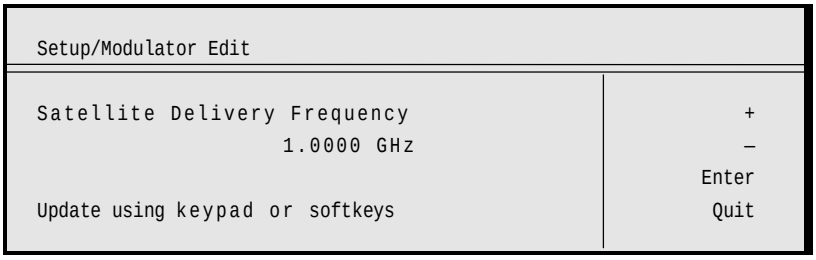


Table 4.92: Sat Del Freq Options

Valid Input Range		Description
Min:	0.0000 GHz	Satellite delivery frequency.
Max:	999.9999 GHz	
Step Size:	0.00001 GHz	

Sat Orb Pos Option

To access the Sat Orb Pos option, press the **Sat Orb Pos** softkey in the Modulator Menu.

This enables the orbital position of the satellite to be specified. This is included in the SI NIT if the Modulator output format is set to IF (see the Output Format option on the Setup/Modulator Menu). If the Modulator output format is set to baseband, then this option setting is ignored and the descriptors included in the NIT are those specified by the options on the Setup/System/SI Menu.

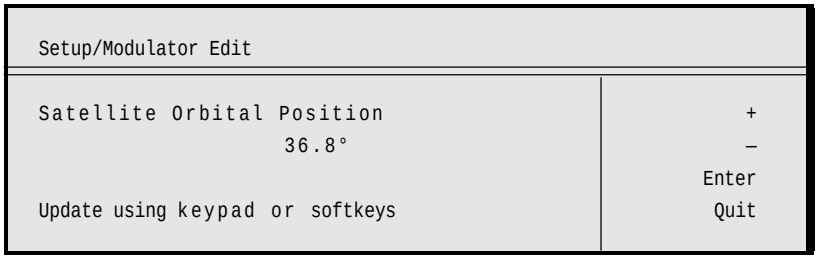
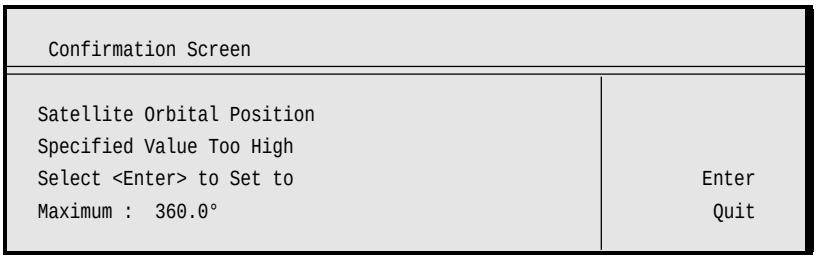


Table 4.93: Sat Orb Pos Options

Valid Input Range	Description
Min: 0.0° Max: 360.0° Step Size: 0.1°	Minimum defaults to 1.0000 GHz Maximum defaults to 22.0000 GHz

If the specified orbital position is outside the valid input range, a confirmation screen similar to the following is displayed which shows the maximum/minimum value allowed.



Sat West/East Option

To access the Sat West/East option, press the **Sat West/East** softkey in the Modulator Menu.

This enables the satellite west/east flag to be specified to indicate whether the satellite position is in the western or eastern part of the orbit. This is included in the SI NIT if the Modulator output format is set to IF (see the Output Format option on the Setup/Modulator Menu).

If the Modulator output format is set to baseband, then this option setting is ignored and the descriptors included in the NIT are those specified by the options on the Setup/System/SI Menu.

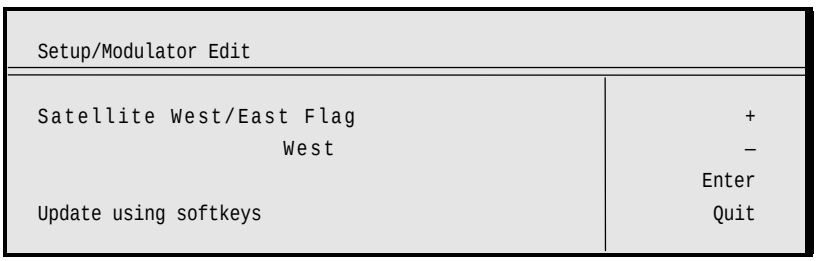


Table 4.94: Sat West/East Options

Selected Option	Description
West	Satellite position is in western part of the orbit.
East	Satellite position is in the eastern part of the orbit.

Polarisation Option

To access the Polarisation option, press the **Polarisation** softkey in the Modulator Menu.

This enables the polarisation of the satellite transponder to be specified. This is included in the SI NIT if the Modulator output format is set to IF (see the Output Format option on the Setup/Modulator Menu).

If the Modulator output format is set to baseband, then this option setting is ignored and the descriptors included in the NIT are those specified by the options on the Setup/System/SI Menu.

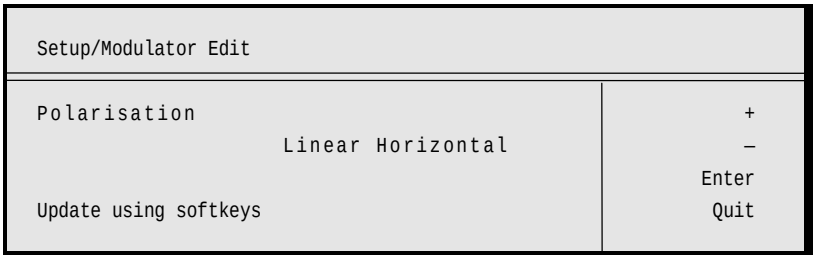


Table 4.95: Polarisation Options

Selected Option	Description
Linear Horizontal	Satellite transponder uses linear horizontal polarisation.
Linear Vertical	Satellite transponder uses linear vertical polarisation.
Circular Left	Satellite transponder uses circular left polarisation.
Circular Right	Satellite transponder uses circular right polarisation.

4.7.3 Baseband (188) Output Format

Top Level Menu

```
Setup/Modulator Edit

Output Format      188 byte ASI                    *
Power On State     IF Off                          *
Avail. Modulator   Int  QPSK only                  *
                                                 Quit
```

Output Format

See Output Format on *page 4-91*.

Power On State

See *Power On State* on *page 4-103*.

Available Modulator

To access the Available Modulator option, press the **Avail.Modulator** softkey in the Modulator Menu.

```
Setup/Modulator Edit

Available Modulator                                +
                      Int. QPSK Only               –
                                                Enter
Update using softkeys                           Quit
```

Table 4.96: Available Modulators Options

Selected Option	Description
Int. QPSK Modulator	
QPSK/OFDM	

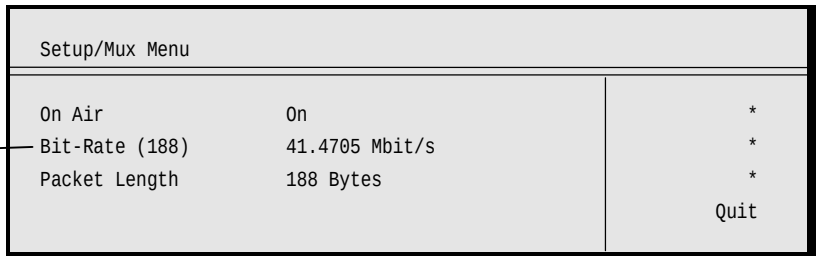
4.8 Multiplexer (Mux) Menus

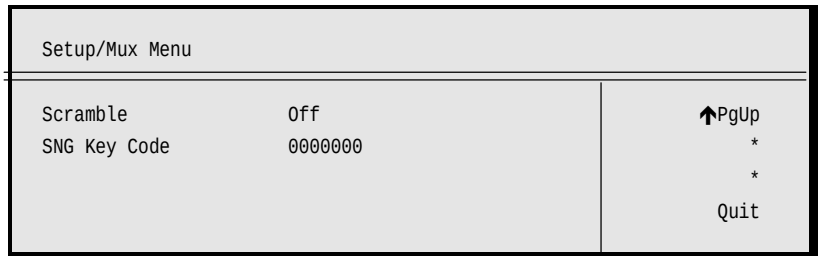
4.8.1 With M2/EOM/RAS RAS Option Enabled

The Mux Menu is selected from the Setup Menu by pressing the **Mux** softkey.

This menu permits the selection of Multiplexer output parameters and RAS scrambling options (if enabled).

Bit-rate (204) may be seen instead.



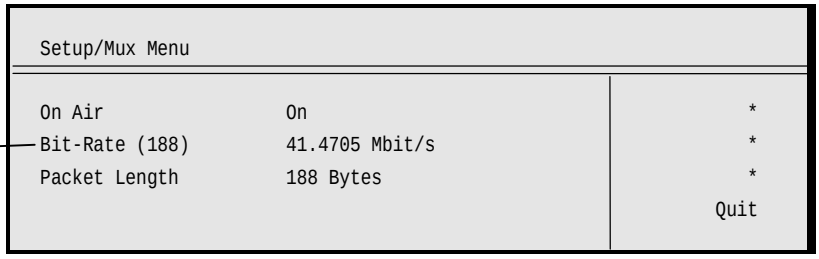


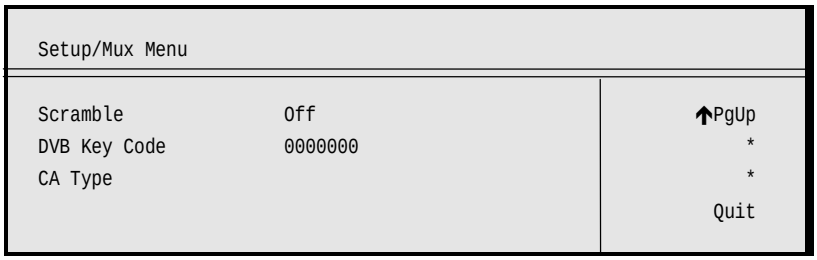
4.8.2 With M2/EOM/BISS BISS Option Enabled (V3.3 on)

The Mux Menu is selected from the Setup Menu by pressing the **Mux** softkey.

This menu permits the selection of Multiplexer output parameters and BISS scrambling option (if enabled).

Bit-rate (204) may be seen instead.





4.8.3 Menu Options (Internal Remux Option not fitted)

Menu Hierarchy

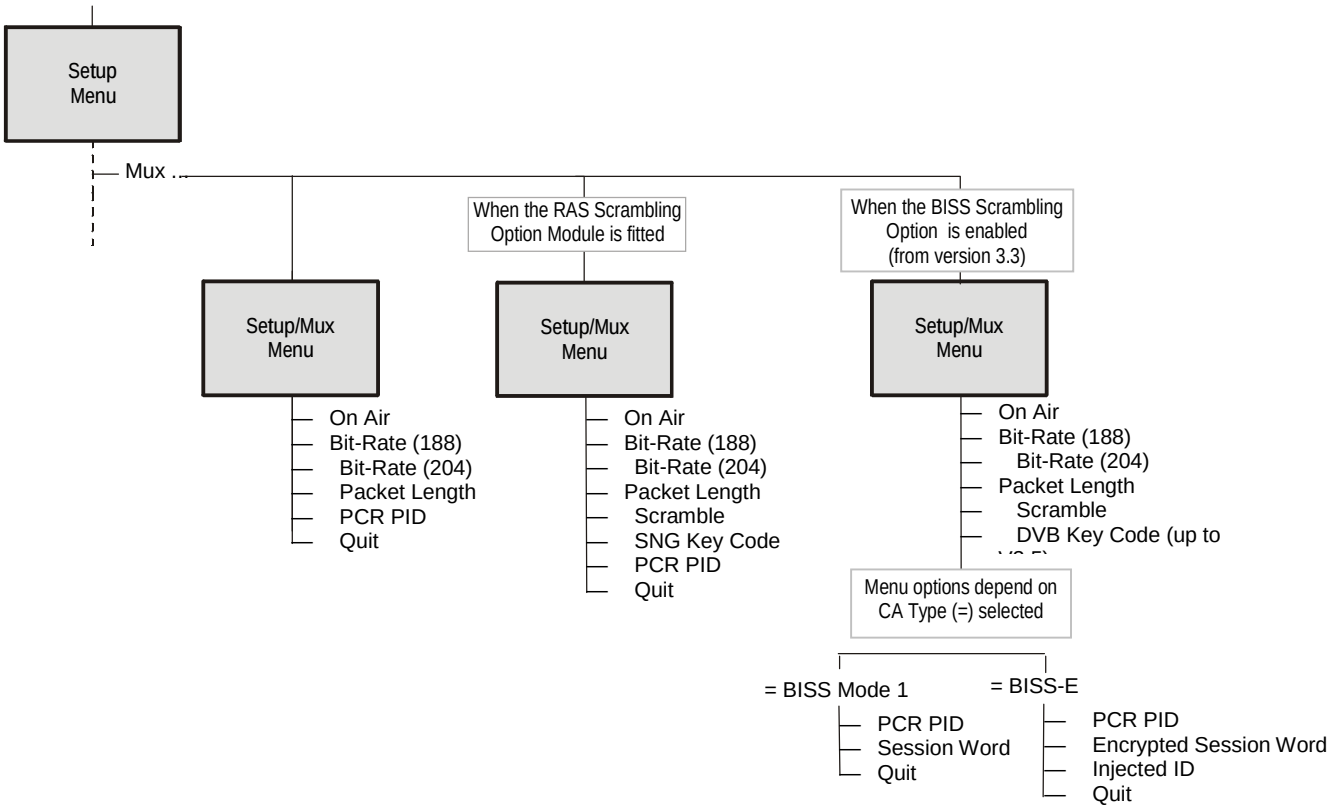


Figure 4.14: Menu Hierarchy – Setup/Mux Menu (Remux Option not fitted)

On Air Option

This option determines whether the output of the Encoder is sent to the Multiplexer. To change the On Air option, press the **On Air** softkey in the Mux Menu.

```
Setup/Mux Edit

On Air                                          +
                        On                      –
                                              Enter
Update using softkeys                          Quit
```

Table 4.97: On Air Options

Selected Option	Description
On	Multiplexer output is switched on.
Off	Multiplexer output is switched off.

Bit-rate (188) and Bit-rate (204) Option

To change either of the bit-rates, press the **Bit-rate (188**) or the **Bit-rate (204**) softkey in the Mux Menu.

The Bit-rate (188) can be in the range of 0 Mbit/s to 54 Mbit/s. The Bit-rate (204) can be in the range of 0 Mbit/s to 54 Mbit/s.

Can also be 204.

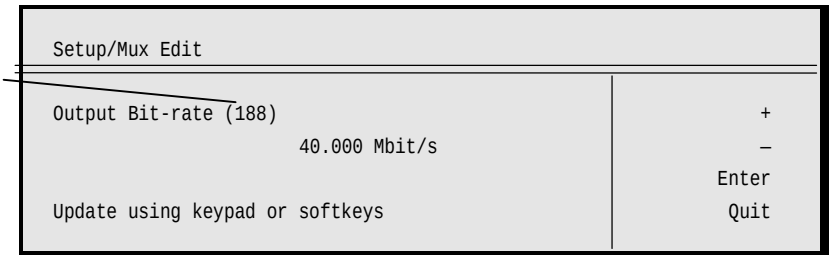
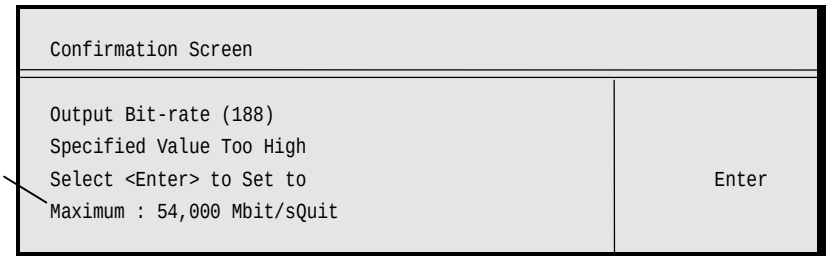


Table 4.98: Bit-rate (188) and Bit-rate (204) Options

Selected Option	Description
188 Min: 0.0000 Mbit/s Max: 54.0000 Mbit/s Step Size: 0.0001 Mbit/s	Multiplexer output bit-rate when in baseband output format and ASI output mode. Changing the bit-rate affects the automatic video bit-rate and video resolution calculations.
204 Min: 0.0000 Mbit/s Max: 54.0000 Mbit/s Step Size: 0.0001 Mbit/s	Multiplexer output bit-rate when in baseband output format and ASI output mode. Changing the bit-rate affects the automatic video bit-rate and video resolution calculations.

If the specified bit-rate is outside the valid input range, a confirmation screen is displayed which shows the maximum/minimum value allowed.

For 204 the maximum bit-rate is 54.0000 Mbit/s.



Packet Length Option

To change the packet length, press the **Packet Length** softkey in the Mux Menu.

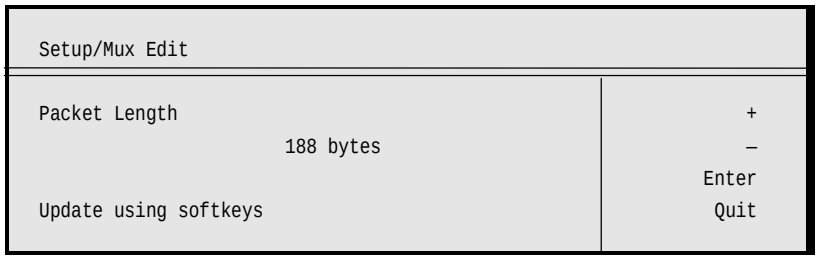


Table 4.99: Packet Length Options

Selected Option	Description
188 bytes	Uses 188 bytes in packet format.
204 bytes	Uses 204 bytes in packet format.

PCR PID

To define which PID carries the PCR, press the PCR softkey in the Mux menu and enter the required PID.

RAS Module Options

Scramble Option

To access the scramble option, press the **Scramble** softkey in the Mux Menu. This enables security scrambling of the Encoder transmission to be switched on or off.

> NOTE...
>
> See *Chapter 5*, *Equipment Description* for details of the RAS Scrambling Module and scrambling modes, including a list of the PIDs that are scrambled when scrambling is enabled.

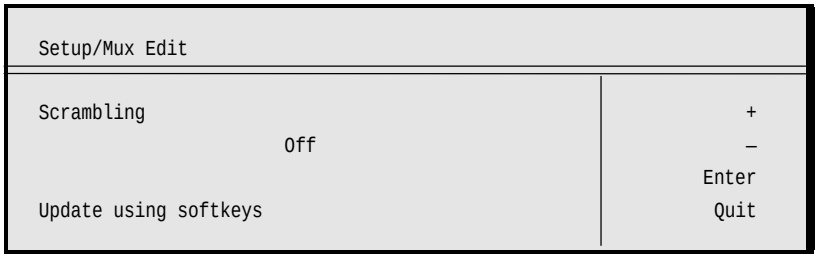


Table 4.100: Scramble Options (RAS Scrambling Module Fitted)

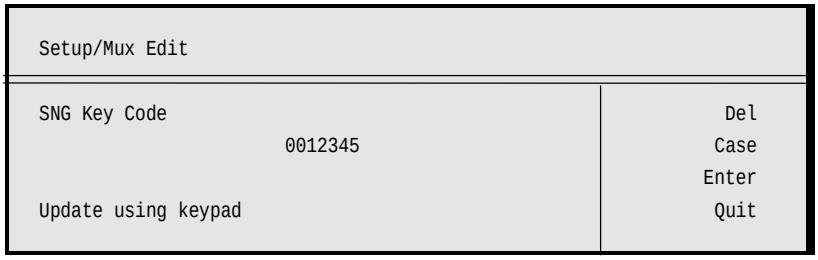
Selected Option	Description
On (SNG Key)	Encoder output is scrambled. Scrambling key used is entered using the SNG Key Code option.
On (Fixed Key)	Encoder output is scrambled. Scrambling key used in assigned by Tandberg Television and pre-programmed into the Encoder.
Off	Encoder output is not scrambled.

SNG Key Code Option

To access the SNG Key Code option, press the **SNG Key Code** softkey in the Mux Menu. This enables the scrambling key used in SNG Key scrambling mode to be set (see the Scramble option). The same scrambling code must be used at the receive end to unscramble the transmission.

Enter up to seven digits using the keypad, then press the **Enter** softkey to enter the scrambling code.

> NOTE ...
>
> If less then seven digits are entered, they are prefixed with 0s (zero) to give a seven digit code.



PCR PID

See *page 110* for details.

BISS Module Options (V3.3 and later)

Scramble Option

The implementation of BISS in this Encoder is **BISS** to **Tech 3290 March 2000** and **BISS-E** to **Tech 3292 April 2001**.

To access the scramble option, press the **Scramble** softkey in the Mux Menu. This enables security scrambling of the Encoder transmission to be switched on or off.

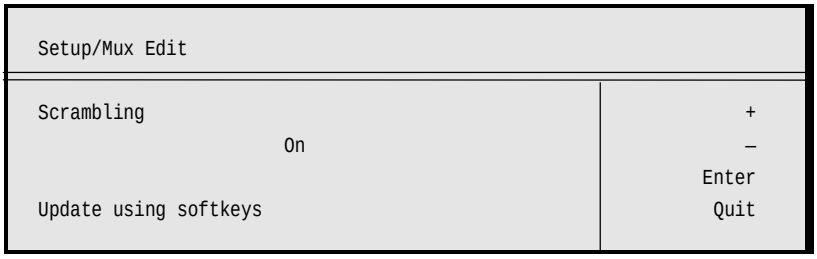


Table 4.101: Scramble Options (BISS Scrambling Module Fitted)

Selected Option	Description
On	Encoder output is scrambled. This Encoder suports two BISS scrambling modes: BISS Mode 1 (which uses a Session Word) and BISS-E (which uses a Session Key and Injected ID).
Off	Encoder output is not scrambled.

DVB Key Code (up to V3.5)

To access the DVB Key Code option, press the **DVB Key Code** softkey in the Mux Menu. This enables the scrambling key used in DVB Key scrambling mode to be set (see the Scramble option). The same scrambling code must be used at the receive end to unscramble the transmission.

For Mode 1, enter a 12-digit code using the keypad, then press the **Enter** softkey to enter the scrambling code.

NOTE...

DVB Key Code is replaced at V3.6 with Session Word for Mode 1 and Session Key/Injected ID for BISS-E.

CA Type Option

To access the Conditional Access Type option, press the **CA Type** softkey in the Mux Menu. This selects the DVB Key scrambling mode to be set. The same mode must be used at the receive end to unscramble the transmission.

NOTES...

1. Only Mode 1 is supported at Motherboard software release 3.3 and later.
2. BISS-E is supported at Motherboard software release 3.6 and later

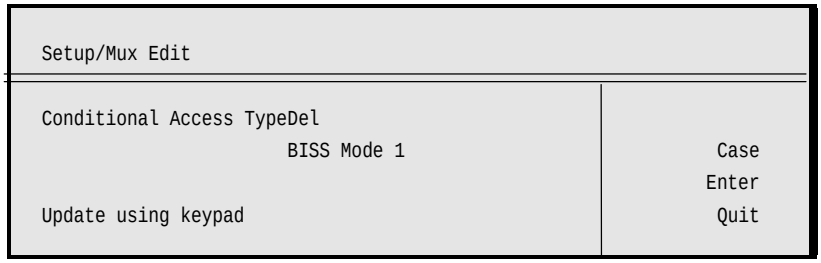


Table 4.102: CA Type Options (BISS Scrambling Module Fitted)

Selected Option	Description	Availability
Mode 1	Same fixed value control word (Session Word) used to scramble all services	V3.3 on
BISS-E	Allows a Session Key to be entered in conjunction with an Injected ID.	V3.6 on

PCR PID

See *page 4-111* for details.

Session Word (V3.6 on)

BISS Mode 1: Uses a 12-digit fixed **Session Word** to scramble the service.

BISS-E: An **Encrypted Session Word** used in conjunction with a 64-bit (entered in hex) Injected ID.

Injected ID (V3.6 on)

The Injected ID is used in conjunction with the encrypted session word in BISS-E to allow more secure transmission and reception.

4.8.4 Menu Options (M2/EOM/REMUX Internal Remux Option Module Fitted)

Overview

The Mux Menu is selected from the Setup Menu by pressing the **Mux** softkey.

> NOTE...
> These menus are only shown when the M2/EOM/REMUX Internal Remux option module is fitted. It can only be fitted into the E5210 and E5410.

This menu permits the selection of remultiplexing parameters.

```
Setup/Mux Menu

Host Mux                                   *
Services                                   *
*                                          *
•                                       Quit
```

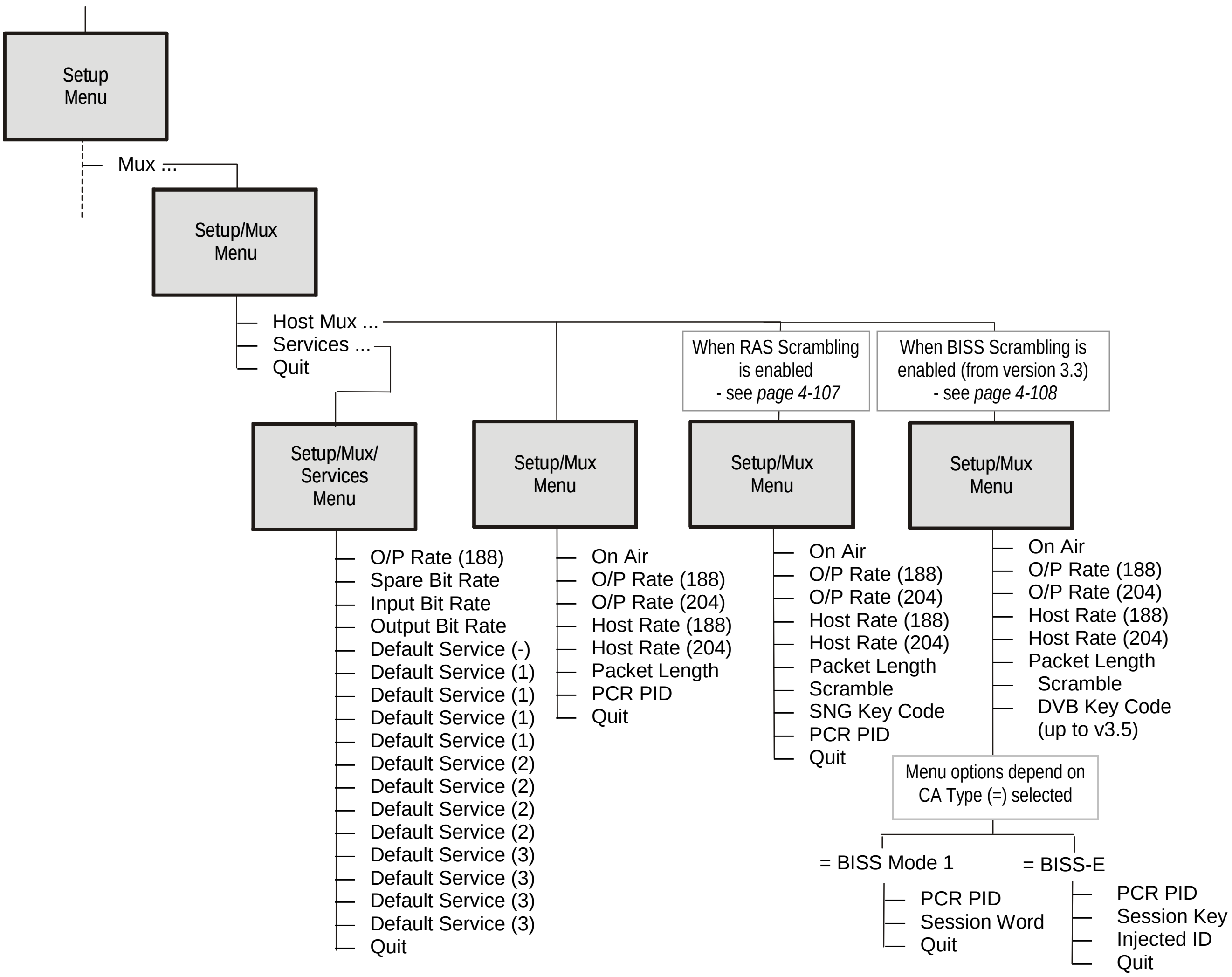


Figure 4.15: Menu Hierarchy – Setup/Mux Menu (M2/EOM/REMUX Remux Option Module Fitted)

Host Mux Menu

Overview

The Host Mux Menu is selected from the Mux Menu by pressing the **Host Mux** softkey. The host is the Encoder that contains the remux card.

This menu provides options for setting the Host Mux parameters.

> NOTE...
> The following example is for no scrambling installed.

```
Setup/Mux/Host Menu

On Air              On                          *
O/P Rate (188)      41.4706 Mbit/s              PgDn
O/P Rate (204)      45.0000 Mbit/s              *
Host Rate (188)     41.4706 Mbit/s              Quit
```

```
Setup/Mux/Host Menu

Host Rate (204)     45.0000 Mbit/s              PgUp
Packet Length       204 bytes                   *
PCR PID                                         *
                                                Quit
```

On Air Option

This option determines whether the output of the Multiplexer is active. To change the On Air option, press the **On Air** softkey in the Host Menu.

```
Setup/Mux/Host Edit

On Air                                          +
                    On                          –
                                                Enter
Update using softkeys                           Quit
```

Table 4.103: On Air Options

Selected Option	Description
On	Multiplexer output is switched on.
Off	Multiplexer output is switched off.

O/P Rate (188) and O/P Rate (204) Option

To change either of the output bit-rates, press the **O/P Rate (188**) or the **O/P Rate (204**) softkey in the Host Menu.

The O/P Rate (188) can be in the range of 0.0000 Mbit/s to 54.0000 Mbit/s. The O/P Rate (204) can be in the range of 0.0000 Mbit/s to 49.7647 Mbit/s.

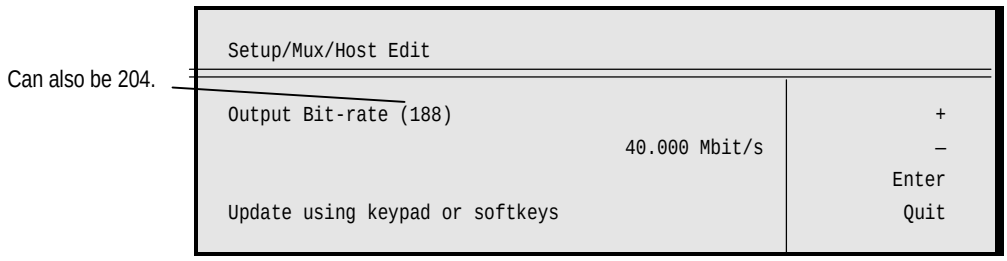


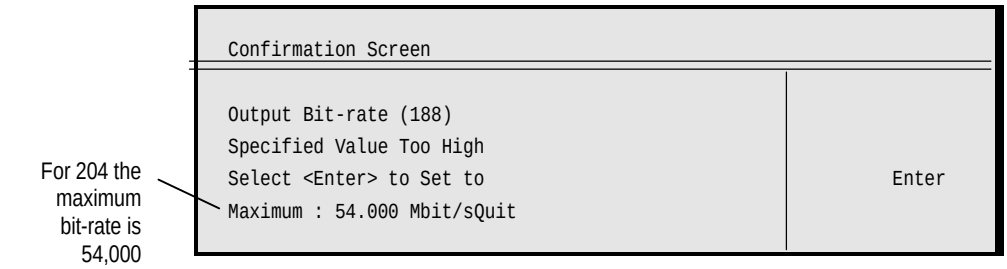
Table 4.104: O/P Rate (188) and O/P Rate (204) Options

Selected Option	Description
188 Min: 0.0000 Mbit/s Max: 54.0000 Mbit/s Step Size: 0.0001 Mbit/s	Multiplexer output bit-rate when in baseband output format and ASI output mode. Changing the bit-rate affects the automatic video bit-rate and video resolution calculations.
204 Min: 0.0000 Mbit/s Max: 54.0000 Mbit/s Step Size: 0.0001 Mbit/s	Multiplexer output bit-rate when in baseband output format and ASI output mode. Changing the bit-rate affects the automatic video bit-rate and video resolution calculations.

NOTE...

For optimum performance the bit-rates given in *Table 4.104* are highly recommended as the maximum to be set. Although it is possible to have higher bit-rates (54.0000 Mbit/s) these may cause erratic operation.

If the specified bit-rate is outside the valid input range, a confirmation screen is displayed which shows the maximum/minimum value allowed.

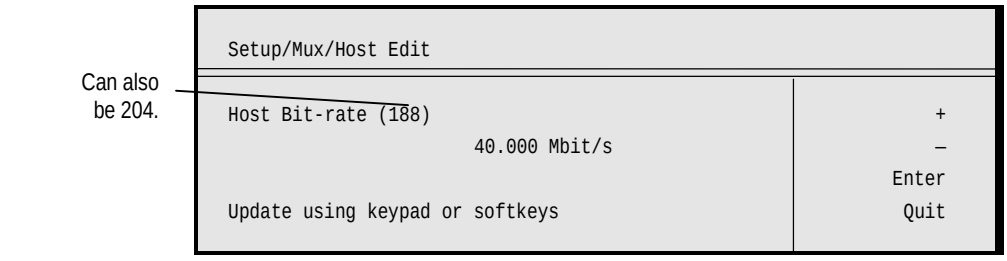


Host Rate (188) and Host Rate (204) Option

These options refer to the multiplex in the local (host) Encoder.

To change either of the Host bit-rates, press the **Host Rate (188**) or the **Host Rate (204**) softkey in the Host Menu.

The Host Rate (188) can be in the range of 0 Mbit/s to 54.0000 Mbit/s in 188 mode or 0 Mbit/s to 49.7647 Mbit/s in 204 Mode.
The Host Rate (204) can be in the range of 0 Mbit/s to 54.0000 Mbit/s.



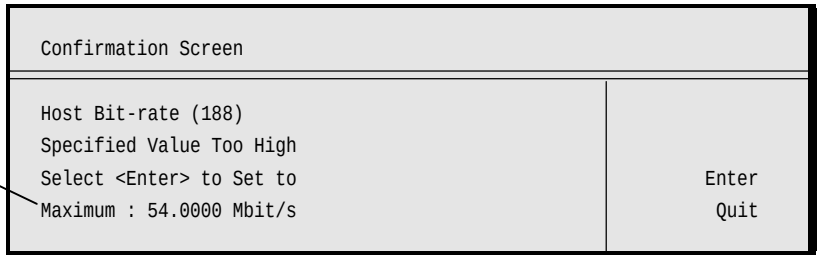
NOTE...

The host rate cannot exceed the output rate (see *page 4-114*, *O/P Rate (188) and O/P Rate (204) Option*).

Table 4.105: Host Rate (188) and Host Rate (204) Options

Selected Option	Description
188 Min: 0.0000 Mbit/s Max: 54.0000 Mbit/s Step Size: 0.0001 Mbit/s	Multiplexer Host bit-rate when in baseband output format and ASI output mode. Changing the bit-rate affects the automatic video bit-rate and video resolution calculations.
204 Min: 0.0000 Mbit/s Max: 54.0000 Mbit/s Step Size: 0.0001 Mbit/s	Multiplexer Host bit-rate when in baseband output format and ASI output mode. Changing the bit-rate affects the automatic video bit-rate and video resolution calculations.

If the specified bit-rate is outside the valid input range, a confirmation screen is displayed which shows the maximum/minimum value allowed.



For 204 the maximum bit-rate is 54.0000 Mbit/s.

Packet Length Option

To change the packet length, press the **Packet Length** softkey in the Host Menu.

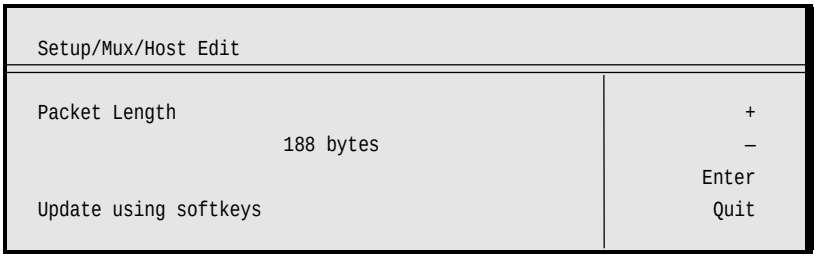


Table 4.106: Packet Length Options

Selected Option	Description
188 bytes	Uses 188 bytes packet format.
204 bytes	Uses 204 bytes packet format.

NOTE...

Other screens are described in *4.8.3 Menu Options (Internal Remux Option not fitted)* on *page 4-108*.

Services

Top-level Menus

The Services Menu is selected from the Mux Menu by pressing the **Services** softkey.

This menu provides options for setting the Services parameters.

O/P and spare bit rates options cannot be changed.

```
Setup/Mux/Services Menu

O/P Rate (188)     28.9209 Mbit/s        *
Spare Bit Rate     41.4706 Mbit/s      ↓PgDn
Input Bit Rate     ■■■■■■■■              *
Output Bit Rate    ■■■■■■■■            Quit
```

The names can be changed to something more meaningful.

```
Setup/Mux/Services Menu

Service Name (-)    On              ↑PgUp
Default Service (1) On              ↓PgDn
Default Service (1) On                *
Default Service (1) On              Quit
```

```
Setup/Mux/Services Menu

Default Service (1) On              ↑PgUp
Default Service (2) On              ↓PgDn
Default Service (2) On                *
Default Service (2) On              Quit
```

```
Setup/Mux/Services Menu

Default Service (2) On              ↑PgUp
Default Service (3) On              ↓PgDn
Default Service (3) On                *
Default Service (3) On              Quit
```

```
Setup/Mux/Services Menu

Default Service (3) On              ↑PgUp
                                      *
                                      *
                                    Quit
```

O/P Rate (188) Option

This is the remultiplexing of the service before output.

To change the output bit-rate, press the **O/P Rate (188**) softkey in the Services Menu. The O/P Rate (188) can be in the range of 0 Mbit/s to 54.0000 Mbit/s.

```
Setup/Mux/Services Edit

O/P Rate (188)                                    +
                        40.000 Mbit/s             –
                                                Enter
Update using keypad or softkeys                 Quit
```

Table 4.107: O/P Rate (188) Option

Selected Option	Description
188 Min: 0.0000 Mbit/s Max: 54.0000 Mbit/s Step Size: 0.0001 Mbit/s	Multiplexer output bit-rate when in baseband output format and ASI output mode. Changing the bit-rate affects the automatic video bit-rate and video resolution calculations.

If the specified bit-rate is outside the valid input range, a confirmation screen is displayed which shows the maximum/minimum value allowed.

```
Confirmation Screen

Output Bit-rate (188)
Specified Value Too High
Select <Enter> to Set to                        Enter
Maximum : 54.0000 Mbit/s                        Quit
```

Spare Bit Rate Option

The Spare Bit Rate cannot be changed.

Input Bit Rate Option

The Input Bit Rate cannot be changed.

Output Bit Rate Option

The Output Bit Rate cannot be changed.

Service Name (-) Option

CAUTION...

When remultiplexing, be aware that both PIDs and Service Names will be remapped according to the Host Encoder input used.

Depending upon the number of inputs to the Remux card there will be between one and thirteen service identifiers shown on the Encoder display. The service from the local Encoder (host) is identified as <Service Name> (-) and the others are related to the input on the Remux card. <Service Name> (1) indicates a service on input 1 etc. All services can be edited to include or remove the service from the output.

To change the Service Name (-) option, press the **Service Name (-)** softkey in the Services Menu.

```
Setup/Mux/Services Edit

Service Name                                    +
                      (-) On                    –
                                              Enter
Update using softkeys                         Quit
```

Default Service Option

To change the Default Service option press the appropriate **Default Service** softkey in the Services Menu.

The number changes according to the default service.

```
Setup/Mux/Services Edit

Default Service                                 +
                      (1) On                    –
                                              Enter
Update using softkeys                         Quit
```

4.9 ATM Network Interface Option Module Menu

4.9.1 Introduction

This menu is only available if one of the M2/EOM/ATM155… ATM Network Interface Option Modules is fitted (see *Section 3.6*).

The ATM Menu is selected from the Setup Menu by pressing the **ATM** softkey.

This menu permits the selection of the ATM parameters.

```
Setup/ATM Menu

Connections                                     Tx
Profiles                                        Rx
Authorisations                                  Phy
General                                         Quit
```

4.9.2 Connections Menu

Overview

The Connections Menu is selected from the ATM Menu by pressing the **Connections** softkey.

This menu permits adding and deleting connections.

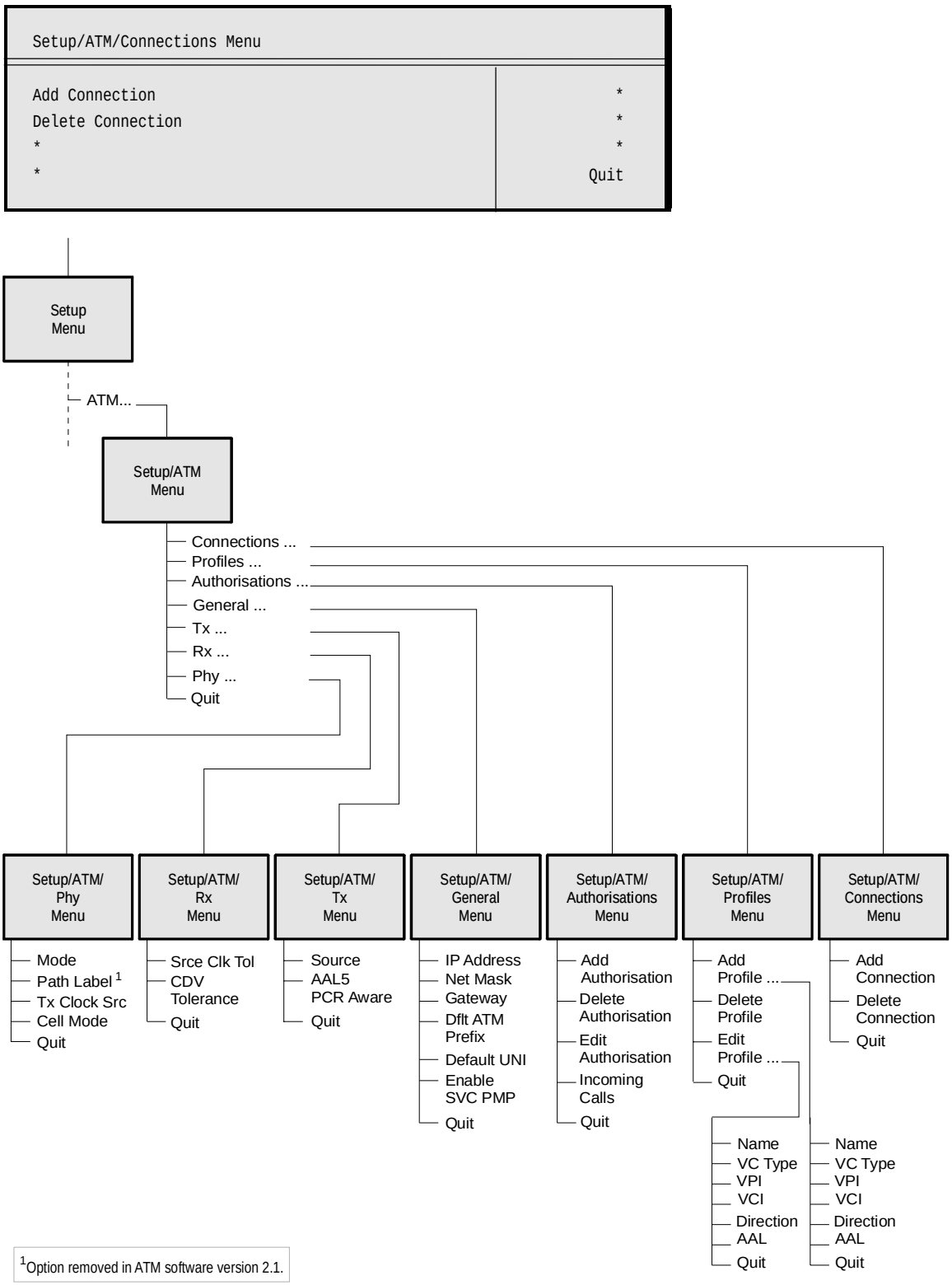


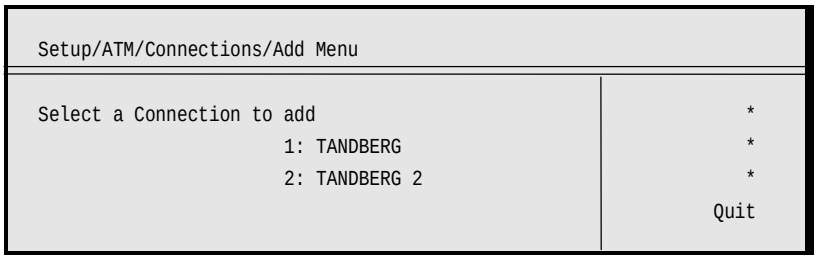
Figure 4.16: ATM Menu

Add Connection Option

To access the Add Connection option, press the **Add Connection** softkey in the Connections Menu. This sets up a Switched Virtual Circuit (SVC) or Permanent Virtual Circuit (PVC) connection to the other end of the network to either transmit, receive or transmit + receive an MPEG-2 transport stream.

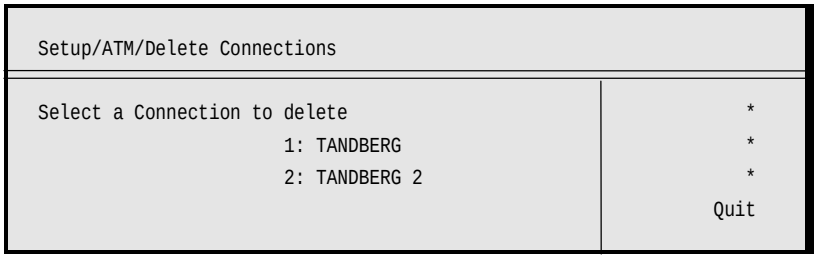
NOTE...

The profile defining the connection parameters must be in the Profile list. There can be one Tx connection and one Rx connection or one Tx/Rx connection active at any time.



Delete Connection Option

To access the Delete Connection option, press the **Delete Connection** softkey in the Connections Menu. This breaks the connection to the network and terminates the MPEG-2 transmission and/or reception. The Connection name is the specified profile name or authorisation name.

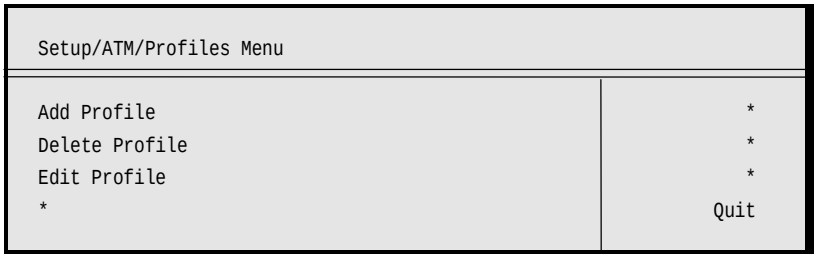


4.9.3 Profiles Menu

Overview

The Profiles Menu is selected from the ATM Menu by pressing the **Profiles** softkey.

This menu permits the selection of Profile parameters.



Add Profile Option

Top-level Menu

To access the Add Profile option, press the **Add Profile** softkey in the Profiles Menu. This defines the connection parameters used to establish a connection to the network. Multiple profiles can be added to the list defining different endpoint addresses or parameters.

```
Setup/ATM Profile Edit

Name                                                    Del
TANDBERG                                                Case
Update using keypad                                     Enter
                        (Upper case)                    Quit
```

Sub-menu Options

A further set of menu options appear.

```
Setup/ATM Profile Menu

Name                    TANDBERG                        *
VC Type                 PVC                             ↓PgDn
VPI                     0                               *
VCI                     49                              Quit
```

```
Setup/ATM Profile Menu

Direction               Tx                              ↑PgUp
AAL                     AAL1 FEC                        *
                                                        *
                                                        Quit
```

Name Option

To access the Name option, press the **Name** softkey in the `Profile Menu`. Use the keypad to amend the profile name (if necessary) and press the **Enter** softkey.

```
Setup/ATM Profile Edit

Name                                                    Del
TANDBERG                                                Case
Update using keypad                                     Enter
                        (Upper case)                    Quit
```

VC Type Option

To access the VC Type option, press the **VC Type** softkey in the `Profile Menu`.

```
Setup/ATM Profile Edit

VC Type                                                 +
                SVC                                     –
                                                        Enter
Update using softkeys                                   Quit
```

Table 4.108: VC Type Options

Selected Option	Description
SVC[10]	Switched Virtual Circuit (SVC).
PVC[11]	Permanent Virtual Circuit (PVC) connection.

VPI Option

To access the VPI[12] option, press the **VPI** softkey in the `Profile Menu`. This allows a Virtual Path Identifier value to be input.

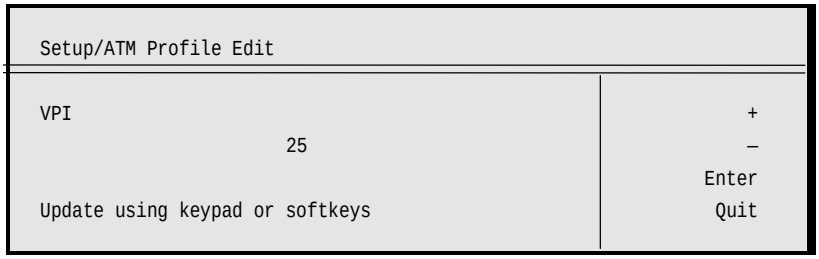


Table 4.109: VPI Options

Selected Option	Description
0 to 255	Enter the Virtual Path Identifier (VPI) value.

VCI Option

To access the VCI[13] option, press the **VCI** softkey in the `Tx Menu`. This allows a Virtual Channel Identifier value to be input.

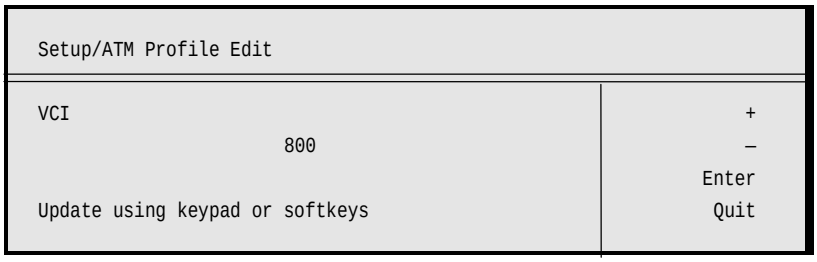


Table 4.110: VCI Options

Selected Option	Description
0 to 65535	Virtual Channel Identifier. Values less than 49 are reserved.

NOTE...

If a value of less than 49 is entered, “Reserved value. Are you sure?” is displayed.

[10] An SVC is a circuit which only exists for the duration of the session, after which it is usually disconnected. Also referred to as “Bandwidth on Demand”.
[11] A PVC is a circuit, equivalent to a dedicated leased line, yet over some form of packet switched network. A PVC is set up once, usually through the management system of the network supporting it, and continues to exist until it is removed, again via the management system.
[12] Virtual Path Identifier – an eight bit field in the ATM cell header which indicates the virtual path over which the ATM cell should be routed.
[13] Virtual Channel Identifier – a unique numerical tag as defined by a 16 bit field in the ATM cell header that identifies a virtual channel, over which the ATM cell is to travel.

Direction Option

To access the Direction option, press the **Direction** softkey in the Profile Menu.

```
Setup/ATM Profile Edit

Direction                                          +
        Tx                                         –
                                                 Enter
Update using softkeys                             Quit
```

Table 4.111: Direction Options

Selected Option	Description
Tx	Transmit direction.
Rx	Receive direction.
TxRx	Bi-directional.

AAL Option

To access the AAL[14] option, press the **AAL** softkey in the Profile Menu. This enables the selection of an ATM adaptation layer used with the MPEG transport stream.

```
Setup/ATM Profile Edit

AAL                                                +
    AAL1 No FEC                                    –
                                                 Enter
Update using softkeys                             Quit
```

Table 4.112: AAL Options

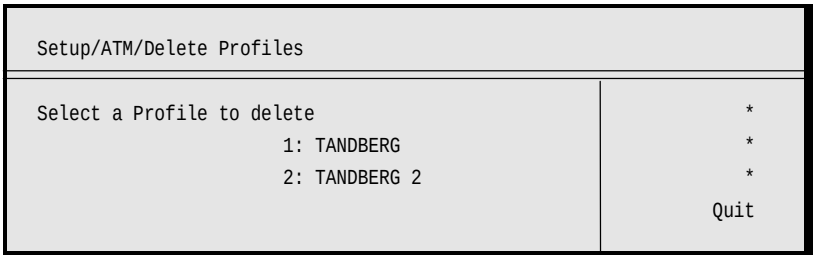
Selected Option	Description
AAL1 FEC	ATM adaptation layer and Forward Error Correction, used with the MPEG transport stream.
AAL1 No FEC	ATM adaptation layer without Forward Error Correction, used with the MPEG transport stream.
AAL5	ATM adaptation layer, used with the MPEG transport stream and ATM signalling.

Delete Profile Option

To access the Delete Profile option, press the **Delete Profile** softkey in the Profiles Menu. Select and delete a Profile by pressing the associated softkey.

> NOTE...
>
> As soon as the associated softkey is pressed the Profile is deleted.

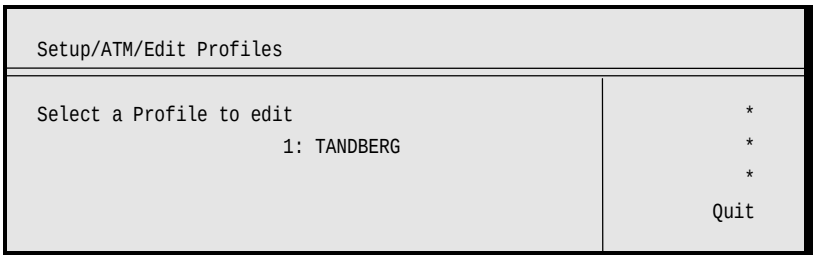
[14] ATM Adaptation Layer – the standards layer that allows multiple applications to have data converted to and from the ATM cell.



Edit Profile Option

Top-level Menu

To access the Edit Profile option, press the **Edit Profile** softkey in the Profiles Menu. Press the associated softkey to edit the selected Profile.



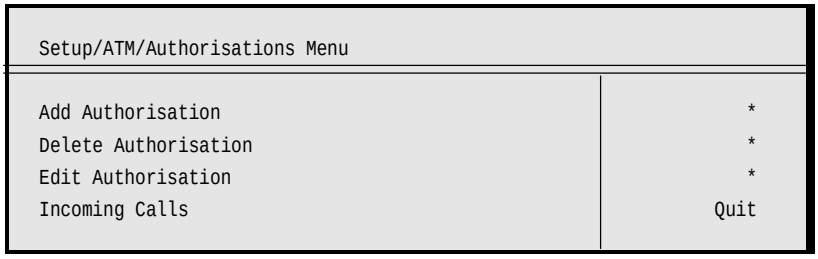
Further screens appear which are the same as those on *page 4-121, Add Profile Option*.

4.9.4 Authorisations Menu

Overview

The Authorisations Menu is selected from the ATM Menu by pressing the **Authorisations** softkey.

This menu permits the selection of Authorisation parameters.



Add Authorisation Option

To access the Add Authorisation option, press the **Add Authorisation** softkey in the Authorisations Menu. This option authorises an ATM address from which SVC connections will be accepted.

> NOTE...
>
> If Incoming Calls is set to *Authorisations* then any incoming connection requests from ATM addresses which aren't in the authorisations list will be rejected.

```
Setup/ATM/Authorisation Edit

Name                                                    Del
Auth 1_                                                 Case
Update using keypad                                     Enter
                        (Upper case)                    Quit
```

Another screen appears. To access the ATM Address option, press the **ATM Address** softkey in the Authorisations Menu.

```
Setup/ATM/Authorisation Menu

Name                    ANOTHER                         *
ATM Address             . . . 0000000000                *
                                                        *
                                                        Quit
```

Delete Authorisation Option

To access the Delete Authorisation option, press the **Delete Authorisation** softkey in the Authorisations Menu. Select and delete an authorisation by pressing the associated softkey.

> NOTE...
> As soon as the associated softkey is pressed the authorisation is deleted.

```
Setup/ATM/Delete Authorisations

Select an Authorisation to delete                       *
                        1: ANOTHER                      *
                                                        *
                                                        Quit
```

Edit Authorisation Option

To access the Edit Authorisation option, press the **Edit Authorisation** softkey in the Authorisations Menu. Press the associated softkey to edit the selected Authorisation.

```
Setup/ATM/Edit Authorisations

Select an Authorisation to edit                         *
                        1: ANOTHER                      *
                                                        *
                                                        Quit
```

Further screens appear which are the same as those on *page 4-125*, *Add Authorisation Option*.

Incoming Calls Option

To access the Incoming Calls (i.e. connections) option, press the **Incoming Calls** softkey in the Authorisations Menu. Press the **Incoming Calls** softkey to access the option.

```
Setup/ATM Incoming Calls Menu

Incoming Calls         Permit All                    *
                                                     *
                                                     *
                                                   Quit
```

```
Setup/ATM Incoming Calls Edit

Incoming Calls                                       +
                       Permit All                    –
                                                   Enter
Update using softkeys                              Quit
```

Table 4.113: Incoming Calls Options

Selected Option	Description
Permit All	Accepts calls from any ATM address.
Refuse All	No incoming calls accepted.
Authorisations	Only accepts calls which are in the authorisations list.

4.9.5 General Menu

Overview

The General Menu is selected from the ATM Menu by pressing the **General** softkey.

This menu permits the selection of general ATM parameters.

```
Setup/ATM/General Menu

IP Address             172.16.248.241                *
Net Mask               255.255.0.0                 ↓PgDn
Gateway                0.0.0.0                       *
Dflt ATM Prefix        . . . 0000000000            Quit
```

```
Setup/ATM/General Menu

Default UNI            UNI 3.0                     ↑PgDn
Enable SVC PMP         Off                           *
                                                     *
                                                   Quit
```

IP Address Option

To access the IP[15] Address option, press the **IP Address** softkey in the General Menu. This is a network address used to identify the ATM interface when plugged into an ethernet network via the 10BaseT socket on the card.

Use the keypad to amend the IP Address.

```
Setup/ATM/General Edit

IP Address                                          Del
                      172.16.248.241                Case
Update using keypad                                 Enter
                      (Upper case)                  Quit
```

Another screen appears. Press the **Yes** softkey to confirm the change or the **No** softkey to cancel it.

```
New ATM IP Address

Change IP Address                                   Yes
from 172.16.248.241                                  No
to   172.16.248.352
Are you sure?                                       Quit
```

Net Mask Option

To access the Net Mask option, press the **Net Mask** softkey in the General Menu.

```
Setup/ATM/General Edit

Net Mask                                            Del
                      255.255.0.0                   Case
Update using keypad                                 Enter
                      (Upper case)                  Quit
```

Gateway Option

To access the Gateway option, press the **Gateway** softkey in the General Menu. This gives the default gateway address used on the ethernet network interface connected via the 10BaseT socket. Any communications to network hosts not on the local IP network will be sent to this address.

```
Setup/ATM/General Edit

Gateway                                             Del
                      0.0.0.0                       Case
Update using keypad                                 Enter
                      (Upper case)                  Quit
```

[15] Internet Protocol.

Dflt ATM Prefix Option

To access the Dflt ATM Prefix option, press the **Dflt ATM Prefix** softkey in the General Menu. This option is a 26 digit hexadecimal number identifying the ATM address prefix defined by the connected ATM network operator. This only needs to be specified if the ATM network does not support Integrated Layer Management Interface (ILMI) which normally sets this prefix automatically

```
Setup/ATM/General Edit

Default ATM Prefix                                  Del
                      47000000000000000000
                      000000_                     Enter
Update using keypad                                Quit
```

Default UNI Option

To access the Default UNI option, press the **Default UNI** softkey in the General Menu. This option is the default User to Network Interface (UNI) protocol version used to communicate with the ATM network, defined by the connected ATM network operator. This only needs to be specified if the ATM network does not support ILMI, which normally automatically negotiates the version to use. Use the softkeys to amend the Default UNI option.

```
Setup/ATM/General Edit

Default UNI Version                                 Del
                      UNI 3.0                       Case
                                                    Enter
Update using softkeys                              Quit
```

Table 4.114: Default UNI Options

Selected Option	Description
3.0	Protocol versions used to communicate with the ATM network, defined by the connected ATM network operator.
3.1	
4.0	

Enable SVC PMP Option

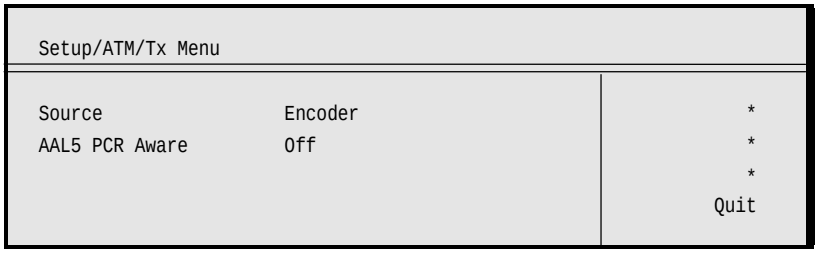
To access the Enable SVC PMP option, press the **Enable SVC PMP** softkey in the General Menu.

```
Setup/ATM/General Edit

Enable SVC PMP                                      +
                      Off                           –
                                                    Enter
Update using softkeys                              Quit
```

4.9.6 Tx Menu

Overview

The Tx Menu is selected from the ATM Menu by pressing the **Tx** softkey. This menu permits the selection of transmitter parameters.



Source Option

To access the Source option, press the **Source** softkey in the Tx Menu. This enables a choice of which MPEG transport stream source is to be transmitted.

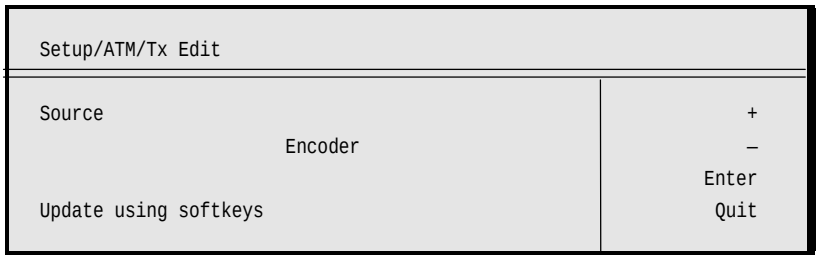


Table 4.115: Source Options

Selected Option	Description
Encoder	Default setting.
ASI Input	External ASI BNC input.

AAL5 PCR Aware Option

To access the AAL5 PCR Aware option, press the **AAL5 PCR Aware** softkey in the Tx Menu. This is an alternative AAL5 transmission mode. Use the **+** and **–** softkeys to alternate between On and Off and then press the **Enter** softkey after selecting one of them. The option is normally set to Off.

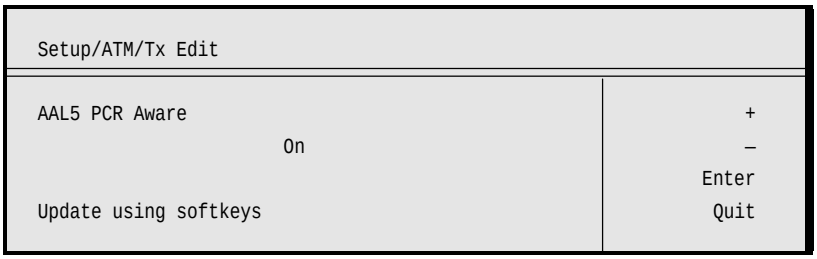


Table 4.116: AAL5 PCR Aware Options

Selected Option	Description
On	AAL5 PCR Aware Option enabled.
Off	AAL5 PCR Aware Option disabled – default setting.

4.9.7 Rx Menu

Overview

The Rx Menu is selected from the ATM Menu by pressing the **Rx** softkey. This menu permits the selection of receiver parameters.

```
Setup/ATM/Rx Menu

Srce Clk Tol          Normal (+/- 30.0ppm)          *
CDV Tolerance         1000 usec                     *
                                                    *
                                                  Quit
```

Srce Clk Tol Option

To access the Srce Clk Tol option, press the **Srce Clk Tol** softkey in the Rx Menu.

This setting affects the reception clock recovery tolerance to the source transmitter clock accuracy, normally set to Normal. If the source clock is known to be accurately calibrated to either the PAL-I or ATSC specification then those settings can be used, resulting in less end-to-end delay.

```
Setup/ATM/Rx Edit

Source Clock Tolerance                              +
                      Normal (+/- 30.0ppm)          –
                                                  Enter
Update using softkeys                             Quit
```

Table 4.117: Srce Clk Tol Options

Selected Option	Description
Normal (+/- 30.0ppm)	
PAL-I (+/- 0.226ppm)	PAL-I source
ATSC (+/- 2.8ppm)	ATSC source

CDV Tolerance Option

To access the CDV[16] Tolerance option, press the **CDV Tolerance** softkey in the Rx Menu.

[16] Cell Delay Variation – a component of cell transfer delay, induced by buffering and cell scheduling.

This setting affects the reception clock recovery tolerance to cell delay variation introduced by the ATM network. Configure it to a value greater than or equal to that specified by the network operator, to handle the worst case but to also achieve the minimum possible end-to-end delay.

> NOTE...
> Excessive end-to-end delay may cause annoyance when, for example, live reporting requires an interactive conversation with the studio. Long pauses may occur as the recipient waits for the reply.

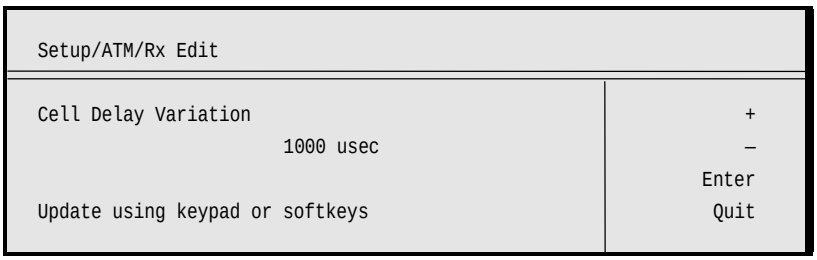


Table 4.118: CDV Tolerance Options

Valid Input Range		Description
Min:	0 µsec	The maximum ATM network Cell Delay Variation of the MPEG transport stream that can be tolerated (in micro (µ) seconds).
Max:	4000 µsec	
Step Size:	1 µsec	

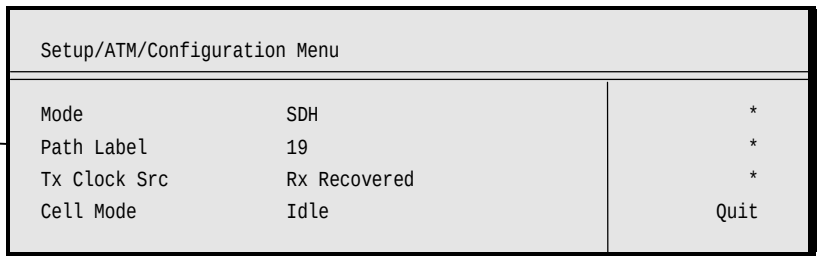
4.9.8 Phy Menu

Overview

The Phy Menu is selected from the ATM Menu by pressing the **Phy** softkey.

This menu permits the selection of the physical layer parameters. The configurable parameters are dependent on the module type fitted. The following menus apply to the Multimode/Monomode OC-3 155 Mbit/s only.

The Path Label option has been removed in ATM software version 2.1



Mode Option

To access the Mode option, press the **Mode** softkey in the Phy Menu.

Match the setting to that of the connected network, normally set to SDH.

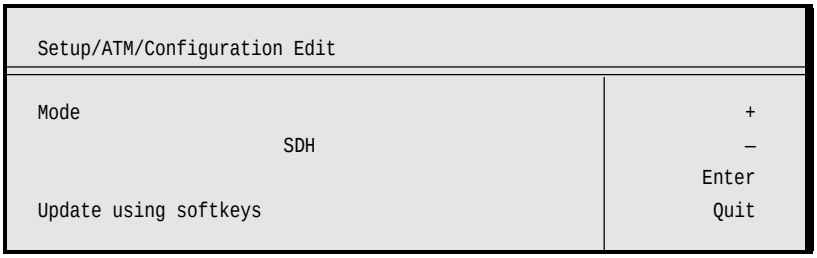


Table 4.119: Mode Options

Selected Option	Description
SDH	Synchronous Digital Hierarchy - the ITU-TSS International standard for transmitting information over optical fibre.
SONET	Synchronous Optical Network - an ANSI standard for transmitting information over optical fibre.

Path Label Option

> NOTE...
> This option has been removed in ATM software version 2.1.

To access the Path Label option, press the **Path Label** softkey in the Phy Menu. The Path Signal Label is transmitted in STM-1/STS-3c frame and identifies to the receiver that the SONET/SDH frames are carrying ATM cells.

> NOTE...
> This MUST be set to the default, which is 19. Do not change or the frames might not be recognised as carrying ATM cells.

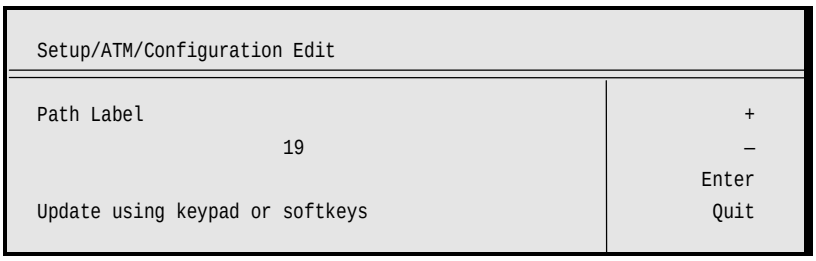


Table 4.120: Path Label Options

Valid Input Range		Description
Min:	0	The path label which identifies ATM cells.
Max:	255	The input must be set to the default value, 19.
Step Size:	1	

Tx Clock Src Option

To access the Tx Clock Src option, press the **Tx Clock Src** softkey in the Phy Menu. This is the physical layer clock reference source used to transmit the data on the interface. It is normally set to 'Rx Recovered' when connected to a switch but when connected directly to another ATM card, one of the cards should be set to 'Local Oscillator'.

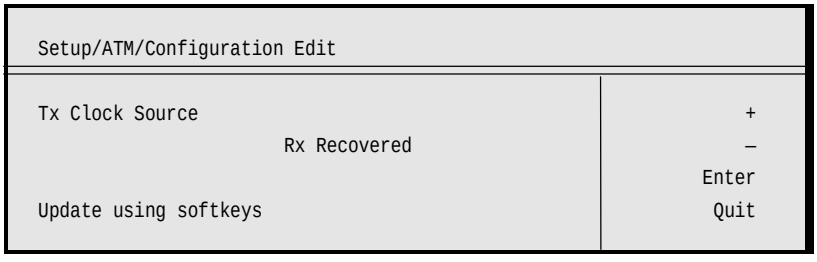


Table 4.121: Tx Clock Src Options

Selected Option	Description
Rx Recovered	Use when connected to a switch.
Local Oscillator	Use when connected directly to another ATM card.

Cell Mode Option

To access the Cell Mode option, press the **Cell Mode** softkey in the Phy Menu. This specifies how null cells should be flagged on the interface, normally 'Unassigned'.

```
Setup/ATM/Configuration Edit

Cell Mode                                              +
                        Idle                           –
                                                     Enter
Update using softkeys                                Quit
```

Table 4.122: Cell Mode Options

Selected Option	Description
Idle	
Unassigned	Default setting.

4.10 M2/EOM/SSI SMPTE 310/ASI Output Module

The SMPTE 310/ASI Output Option Module requires no setting up and no menu options are displayed. The software and firmware versions of the module can be found on the status menu for the mux (see *Figure 4.21*).

4.11 Input Monitor

The Input Monitor screen is selected from the Top Level Menu by pressing the **Input Monitor** softkey. The Input Monitor Screen shows a picture of the currently selected video source, the service name of the video channel being encoded, the audio A and B channels in the form of bargraphs, and the multiplexer and video bit-rates. Press the **Quit** softkey to return to the Top Level Menu.

4.12 Status Menu

4.12.1 Introduction

The Status Menu shows the current parameter settings of the Encoder. Refer to *Figure 4.17* to *Figure 4.22* for the structure of the Status Menu. The screens can only be viewed, data cannot be changed.

4.12.2 Status/System Menu

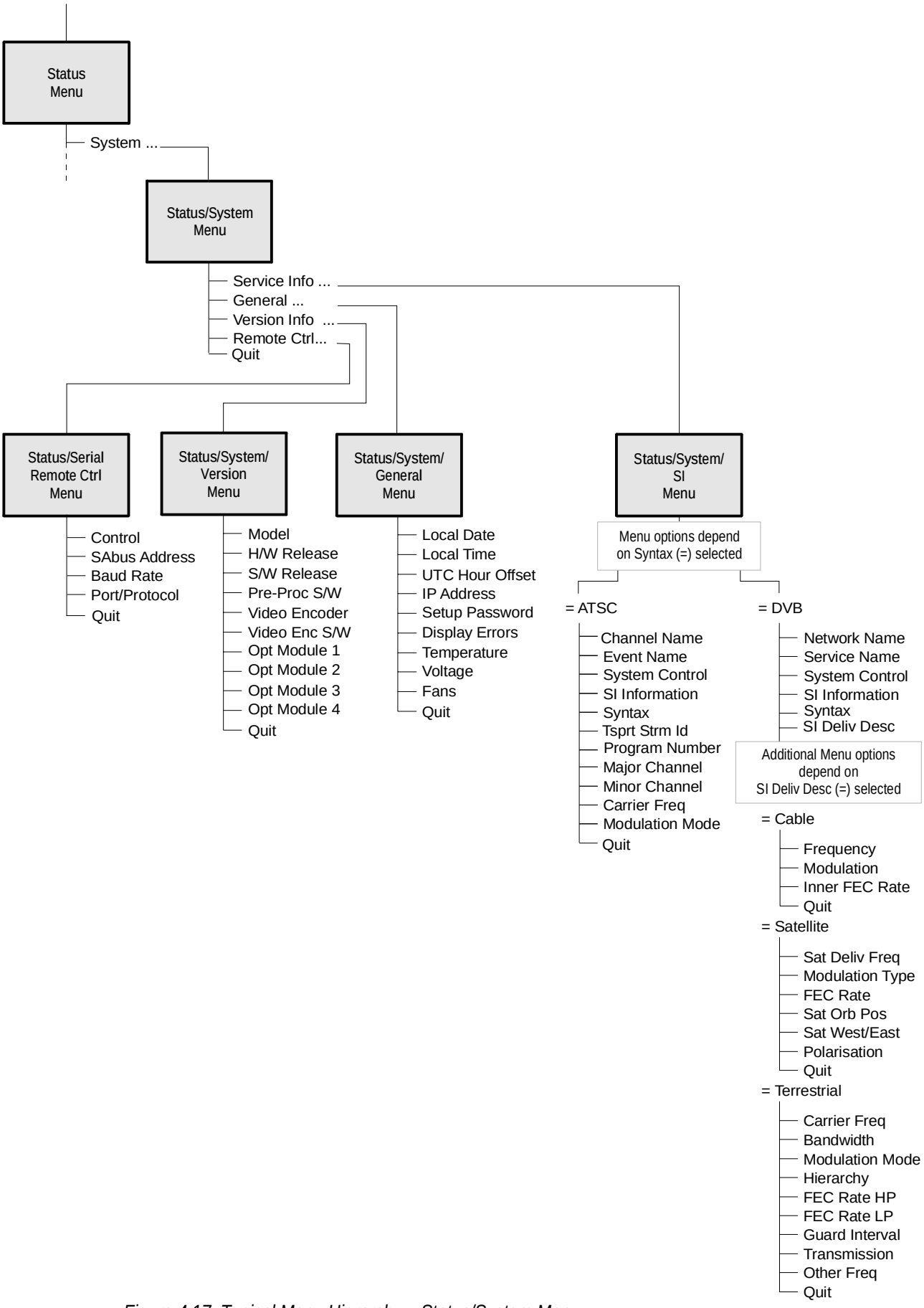
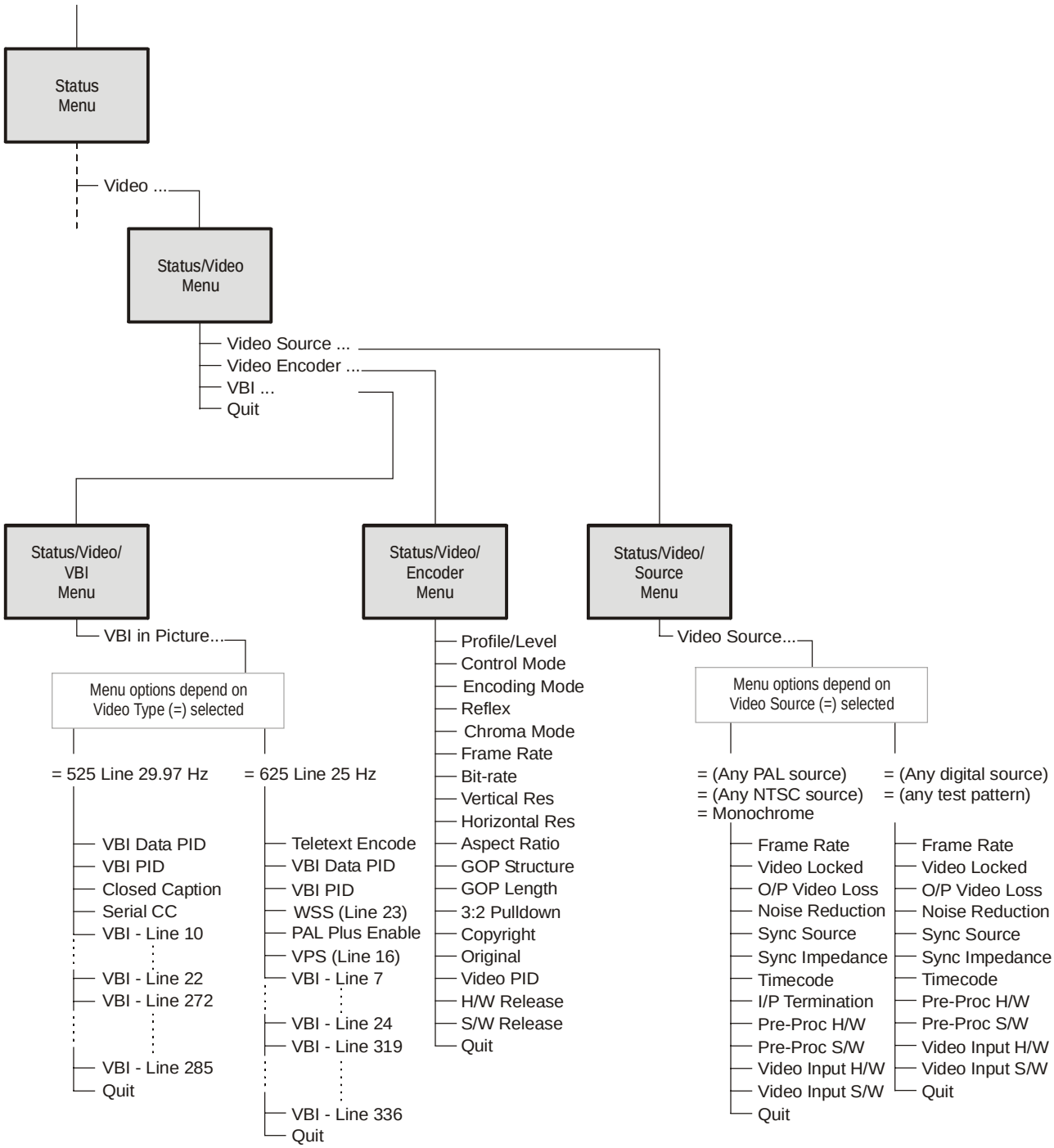


Figure 4.17: Typical Menu Hierarchy – Status/System Menu



4.12.3 Status/Video Menu

Figure 4.18: Typical Menu Hierarchy – Status/Video Menu

4.12.4 Status / Audio Menu

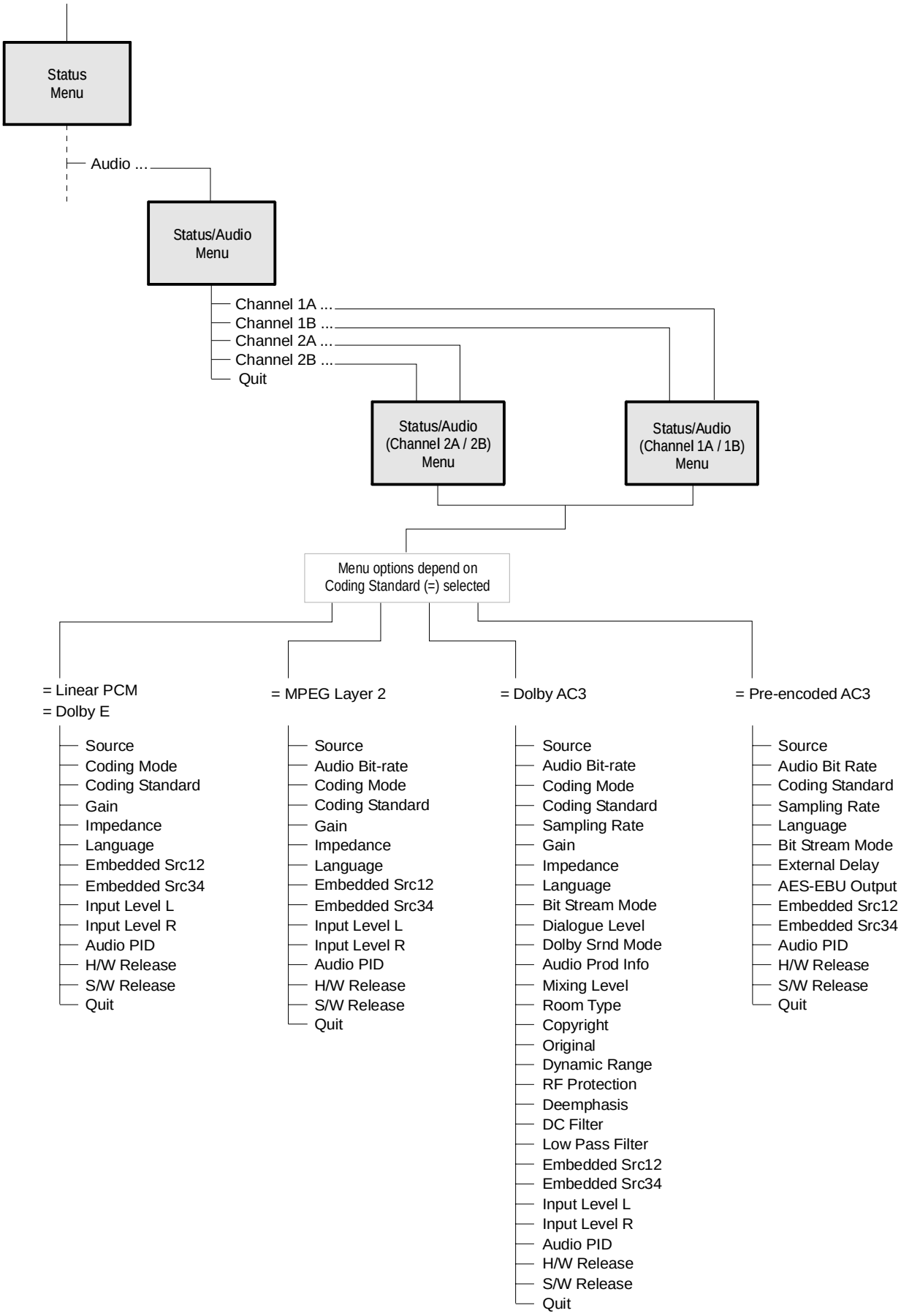


Figure 4.19: Typical Menu Hierarchy – Status/Audio Menu

4.12.5 Status/Data and Status/Modulator Menu

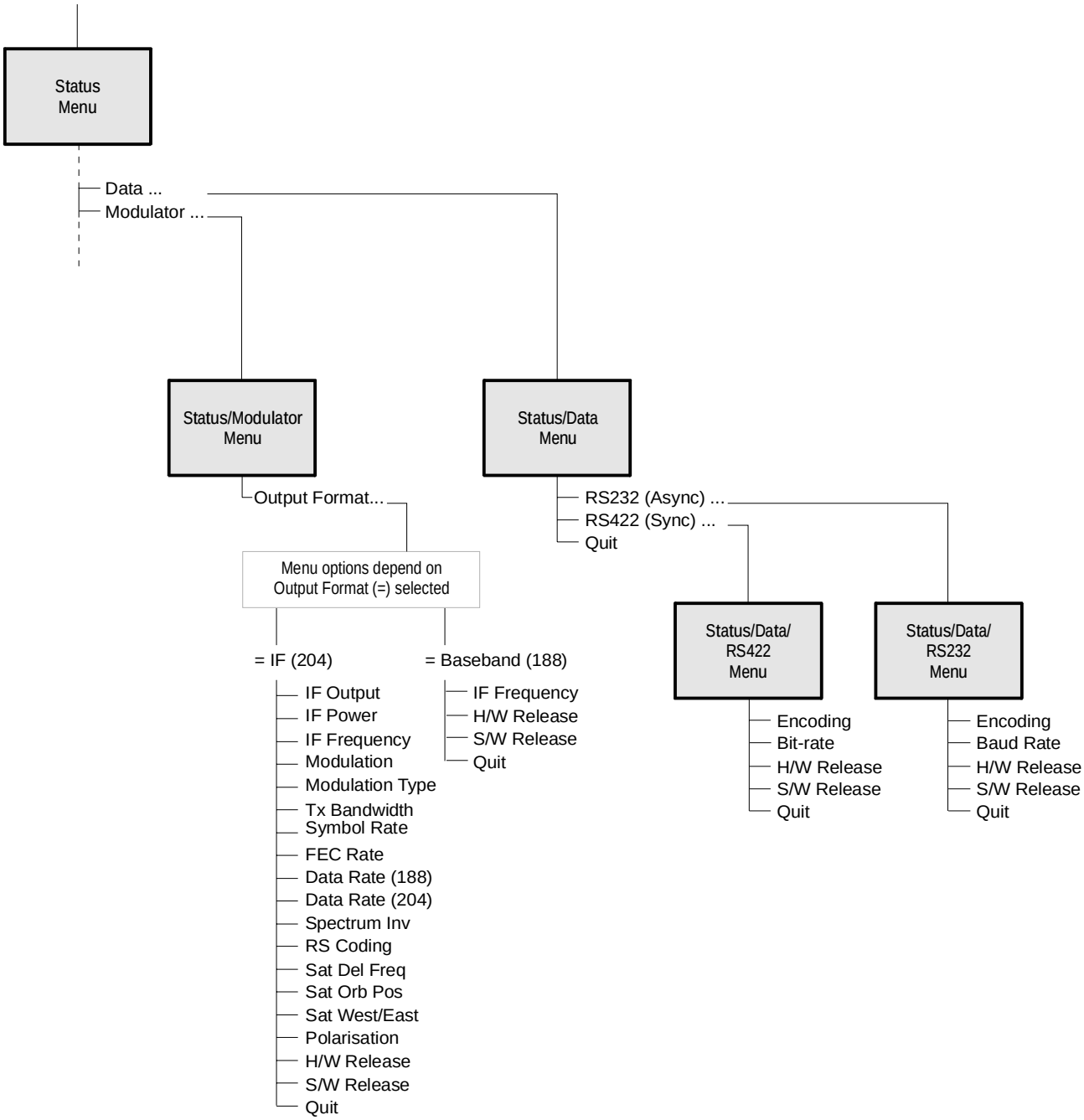


Figure 4.20: Typical Menu Hierarchy – Status/Data Menu and Status/Modulator Menu

4.12.6 Status/Mux Menu

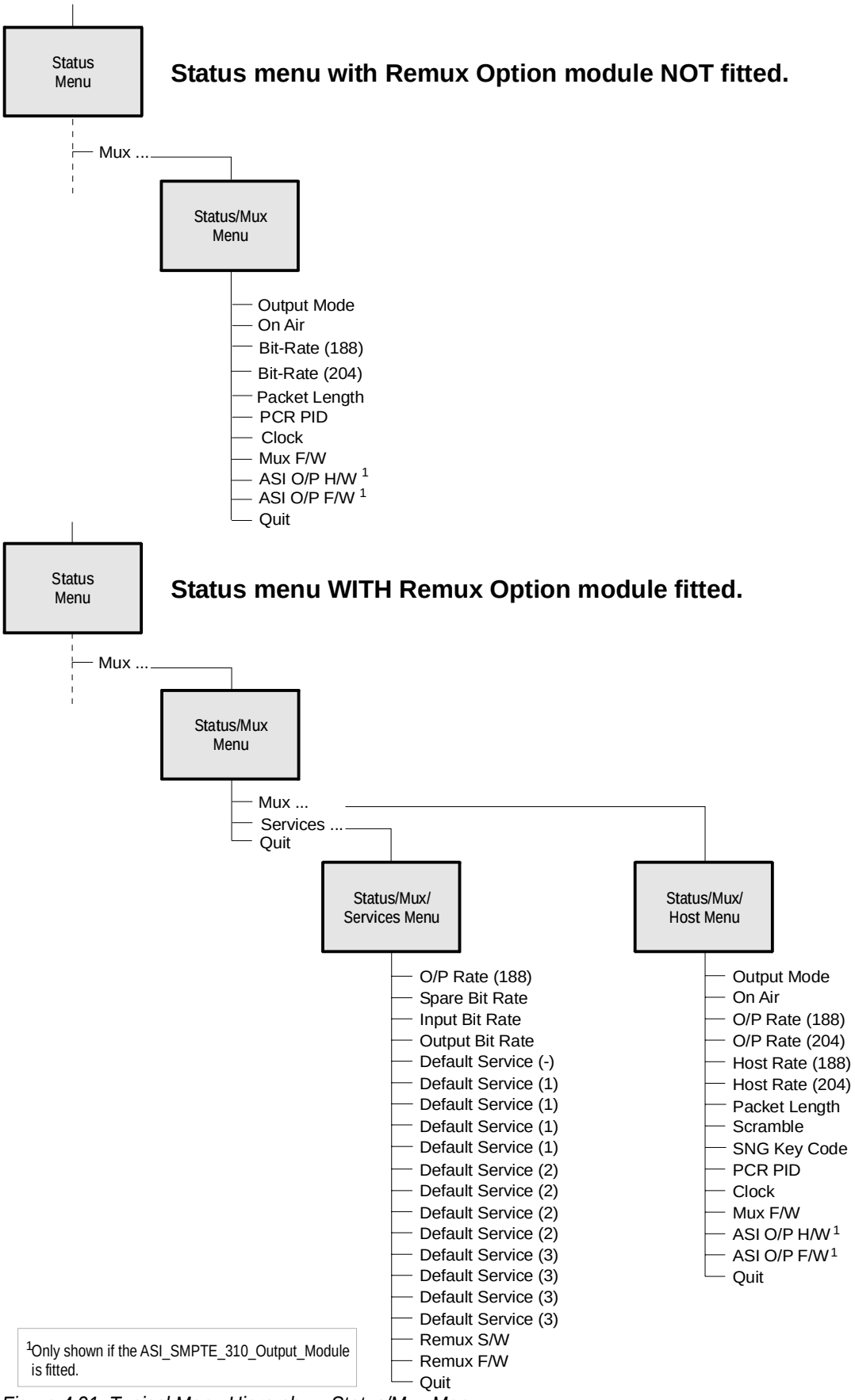


Figure 4.21: Typical Menu Hierarchy – Status/Mux Menu

4.12.7 Status/ATM Menu

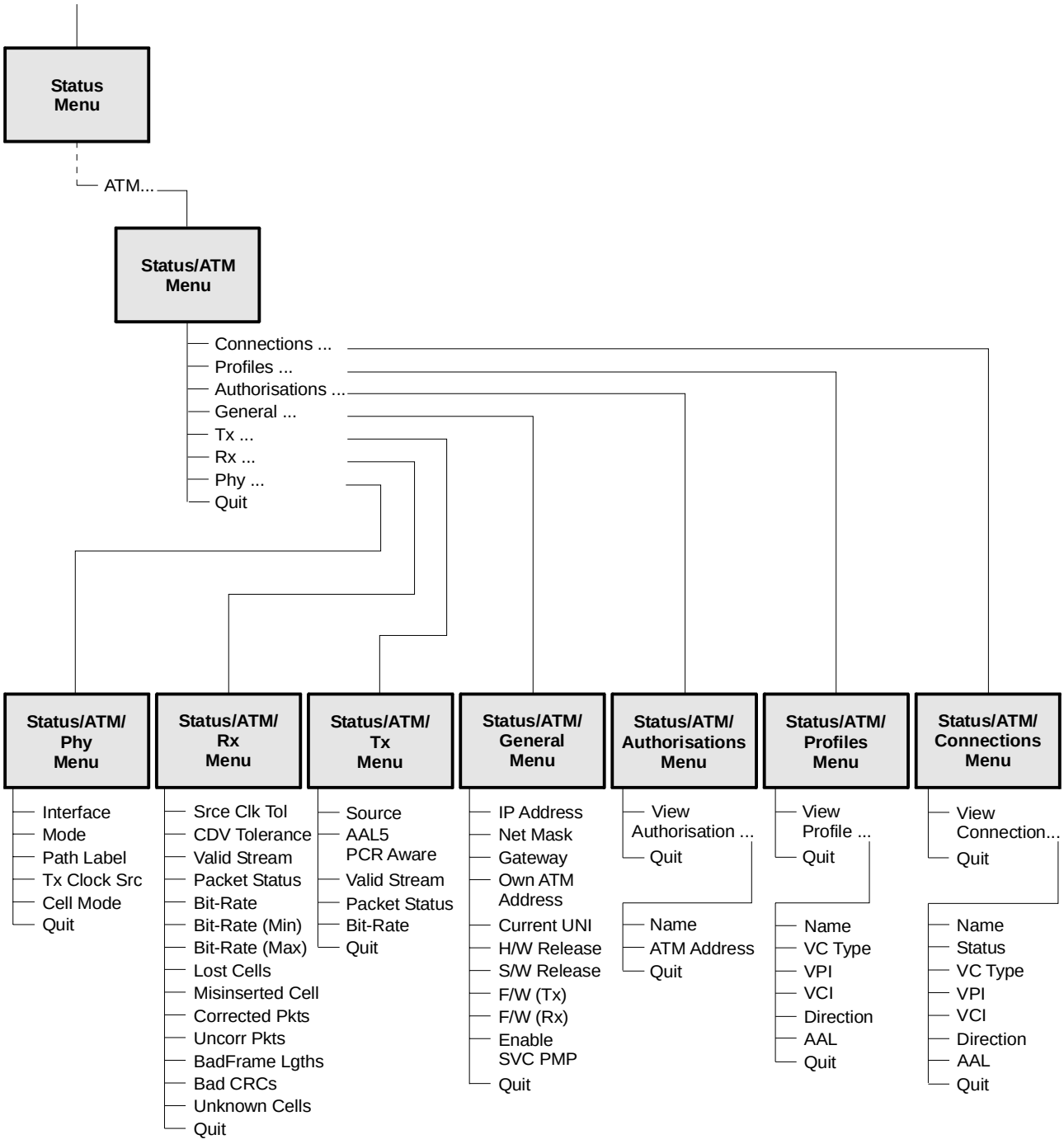


Figure 4.22: Typical Menu Hierarchy – Status/ATM Menu

Chapter 5

Equipment Description

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5.1 Overview of Video Coding

5.1.1 Information Redundancy

The fundamental objective of the coding scheme is to exploit information redundancy in the input video signal to minimise the amount of data required for successful transmission. To achieve this, the Encoder uses a number of uniquely designed interactive processes. The resultant compressed bit-stream syntax conforms to the ISO 13818 MPEG-2 standard. An explanation of the overall coding strategy follows.

5.1.2 Frame Types

Coding operates on a frame (or picture) based principle. There are three frame types:

- I (intra-coded frames)
- P (predicted frames)
- B (bi-directionally predicted frames)

P and B frames are known as inter-coded frames. Coding of I frames occurs without reference to any other frames. P frames use motion compensation from a previous I or P frame. B frames are coded using motion compensation from a previous and/or a future I or P frame. Thus, a coding scheme may contain a mix of I, B and P. *Figure 5.1* illustrates the coding process.

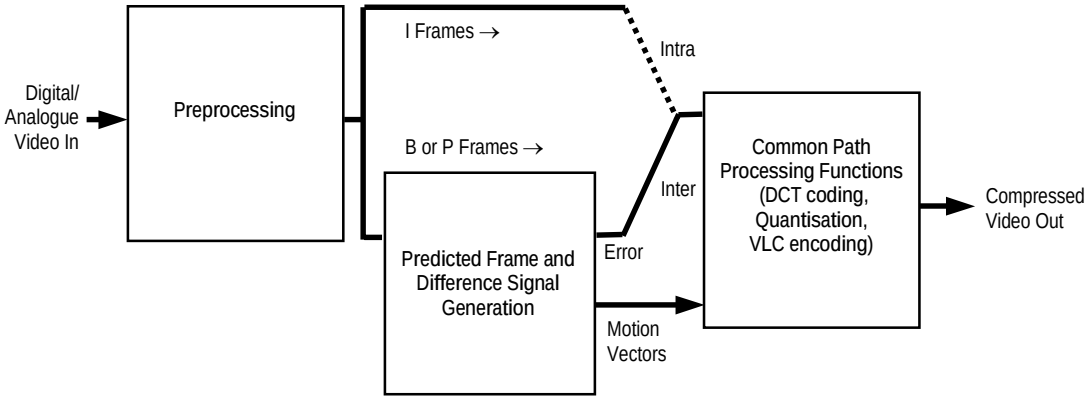

Figure 5.1: Coding Scheme Block Diagram

Preprocessing of the digital or analogue video input signal adapts it to the requirements of the main processing circuits in the Encoder. This preprocessing includes down-sampling of the chrominance and, optionally, down-sampling of the luminance depending on the required degree of compression. The output of the preprocessor is digital 656 video.

The 656 video feeds into the Video Compression Module where the MPEG video processing takes place. This processing produces I frames; this mode of operation is known as **intra-frame** coding.

A feedback path is fed to the motion-compensated Predicted Frame and Difference Signal Generation function which subtracts a predicted frame from the current frame to produce a frame difference or prediction-error value. This prediction-error value is coded instead of the complete frame information, thus affording a considerable saving in bit-rate; this mode of operation is known as **inter-frame** coding. The prediction-error information is augmented by motion vector information which is also coded and enables recovery of the current complete frame information by a Decoder.

The I frames and prediction-error values are processed in blocks of 8x8 pixels which are first transformed by a Discrete Cosine Transform (DCT).For typical images, the distribution of the coefficients is not uniform due to spatial redundancy, and the energy tends to be concentrated into the low frequency coefficients. The number of bits required for a block is reduced by not transmitting the near-zero coefficients and by quantising the remaining ones. Quantisation results in a reduction of the number of possible values to be transmitted. These values are then entropy-coded using a Variable Length Code (VLC). The VLC allocates codes which have different lengths depending upon the probability with which they are expected to occur.

5.1.3 Frame Sequence

Depending on the predicted frame production method, P or B frames are produced for inter-coding.

The regular transmission of an I frame, at user selectable intervals (usually every 12 frames), provides a regular reference from which predicted frames can be generated, thereby ensuring that predictions do not become wildly inaccurate.

The run of frames from the start of an I frame to the start of the next I frame is known as a group of pictures (GOP). Each GOP is identified by a unique header.

The Encoder GOP structure may be selected to be:

- **IP**, for non-B frame operation (IPPPPPPPPPPI)
- **IBP**, for operation with B frames (IBPBPBPBPBPI)
- **IBBP**, for successive B frames (IBBPBBPBBPBBPI)
- ***IBBBP**[1]**,** (IBBBPBBBPBBBI)
- ***IBBB**[1]**,** (IBBBIBBBIBBBIBBB) - a professional editing standard
- ***IBB,** (IBBIBBIBBIBBIBBIBBI) - a professional editing standard
- ***IB,** (IBIBIBIBIBIBIBIBIB) - a superior professional editing standard
- ***I Frame,** (IIIIIIIIIIIIIII) - for professional editing and compression

> NOTE...
>
> Those GOP marked with an asterisk (*) are only available for selection from the front panel, not the MCC.

[1] IBBB and IBBBP are available in Encoder model E5610[/48V] only.

5.2 Multiplexing Modes

5.2.1 Introduction

There are two types of multiplexing available with the System 3000 range of equipment.

In the simplest mode of operation, called conventional multiplexing, the user, via the MCC or front panel, allocates a fixed bit-rate to each Encoder. The operator can use the MCC or front panel displays to manually alter an Encoder's bit-rate.

The second system, implemented using Reflex software, allocates a group bit-rate to a set of Encoders. The Multiplexer then apportions the bit-rate to the Encoders according to the requirements of the picture encoding process.

> NOTE...
> Reflex is only available in the E5610[/48V] Encoder.

5.2.2 Summary of Multiplexing Modes

Conventional Multiplexing

The major features of conventional multiplexing are:

- Uses constant bit-rate
- Bit-rate determined by operator
- Bandwidth utilisation maximised by the operator
- Non-optimum usage of channel capacity in systems with varying picture content
- Use of fixed bit-rate leads to variable picture quality

Statistical Multiplexing

The major features of statistical multiplexing are:

- Uses variable bit-rate
- Employs real-time bit-rate management
- Continuously reallocates bandwidth between Encoders (within a set group)
- Maintains a target picture quality on all channels

5.2.3 Conventional Multiplexing

Limitations of Fixed Bit-rate Encoding

In the conventional multiplexing mode, the bit-rate for an Encoder is allocated at the start of a scheduled period. Each individual Encoder is unable to respond dynamically to the complexity or speed of change of the picture. Because of this, the picture quality decreases and the decoded output contains more encoding distortions as the material becomes more demanding.

Allocation of Bit-rates

The operator must take into account the likely or known peaks in picture complexity to allocate a bit-rate which would avoid compression artefacts. The fixed bit-rate is, therefore, set at the level required to satisfy peak demands. This, inevitably, leads to the non-optimal use of the channel capacity.

5.2.4 Statistical Multiplexing

Advantages of Statistical Multiplexing

In the statistical multiplexing (Reflex) mode, a group bit-rate is dynamically allocated in real-time between a set of Encoders (usually four or more).

The operator assigns a relative quality to each Encoder in a set. This is a measure of the picture quality expected from each Encoder. A preference can be assigned to a channel by allocating a higher than average relative quality to the appropriate Encoder. Excess bit-rate from one Encoder can be reallocated to another to keep it at its picture quality target.

Role of the Multiplexer in Statistical Multiplexing

The Multiplexer requests picture quality information in turn from each Encoder in a set. Using this information, the Multiplexer calculates any changes to the apportionment of the group bit-rate to ensure the target relative picture quality for each Encoder is maintained.

The system responds to variations in the criticality of the source pictures so that the Multiplexer is able to maintain overall picture quality targets by readjusting bit-rate allocations.

Features of the Reflex Software

The major features of the Reflex software are:

- Seamless bit-rate change from 500 kbit/s to 10 Mbit/s or 5 Mbit/s to 33 Mbit/s (depending on operational mode) in a single frame, two fields, period (40 ms for PAL-I and 33 ms for NTSC-M)
- Each Encoder can be given a weighting factor (see *Weighting Factor*)
- Once configured, the Reflex system requires no further operator involvement
- Relies on the statistical distribution of bit-rate demand across programme sources
- Exploits the likelihood that peaks in demand are infrequent on any single channel

5.2.5 Using Statistical Multiplexing

Introduction

The following information explains the use of statistical multiplexing. The parameters are entered via the Multiplex Element Manager (MEM) for use by the Multiplexer.

Allocation of Bit-rates

A Reflex group (set of Encoders) is allocated a total bit-rate which creates a pool from which the Encoders can draw. The following points should be noted in setting up a group:

- The number of Encoders in the group
- The resolution each group is set to
- The types of material being encoded by each Encoder
- The noise levels present in the source material
- The required picture quality

Table 5.1 can be used as a guideline.

Table 5.1: Bit-rates for Various Programme Types

Resolution	Bit-rates for Various Programme Types (Mbit/s) Using Reflex			
(pixels)	Sport	News	Film	General
704 x 576	4.0+	3.0+	3.0+	3.5+
544 x 576	2.0 - 4.0	2.0 - 3.0	1.5 - 2.5	2.5 - 3.5
352 x 576	1.0 - 2.0	1.0 - 2.5	1.0 - 2.0	1.0 - 3.0

An example of a bit-rate allocation is given in *Table 5.2*. The operator can monitor the quality on each channel and adjust the bit-rate allocation.

Table 5.2: Bit-rate Allocations

Encoder	Resolution (pixels)	Programme Type	Allocated Bit-rate (Mbit/s)
1	704 x 576	Sport Channel	6.0
2	544 x 576	Sport Channel	4.0
3	544 x 576	News Channel	3.0
4	544 x 576	Film Channel	2.0
		TOTAL:	15.0

The more Encoders there are in a group, the more potential there is to reduce the group bit-rate, although this may have to be modified in the light of any remultiplexing further downstream.

Weighting Factor

A weighting factor can be assigned to each Encoder in a group to create a bias to that channel. In the example shown in *Table 5.2*, Encoder 1 can be given priority thus ensuring higher picture quality in the event of a conflict. If no bias is required, the weighting factor should be set to the same value.

Table 5.3: Example of Weighting Factor Allocation

Encoder	Resolution (pixels)	Target Picture Quality	Average Bit-rate (Mbit/s)
1	704 x 576	95	6.0
2	352 x 576	80	4.0
3	352 x 576	80	3.0
4	352 x 576	80	2.0
		TOTAL:	15.0

Minimum and Maximum Bit-rates

Minimum Bit-rate

These parameters are set up to restrict the operating bit-rate range for an Encoder. In practice, this restricts the degree to which other Encoders in the Group can borrow bit-rate allocation.

Table 5.4: Coding Resolutions Minimum Bit-rates

Coding Resolution (pixels)	Preferred Minimum Bit-rate (Mbit/s)
704 x 576	1.5
544 x 576	1.0
352 x 576	0.7

Higher minimum bit-rates can be set up but these reduce the availability of excess bit-rate allocation for sharing.

Maximum Bit-rate

The maximum bit-rate allocation of any Encoder should not exceed half the total group bit-rate.

Group Performance

Defining the Term

The Group Performance provides a performance check on the statistical multiplexing process. In general, the bigger the Encoder group the more scope for a better performance figure. A group containing reasonable weighting factors compared to the group bit-rate will also have a better group performance figure.

Monitoring Group Performance

Group Performance can be monitored via the MCC user interface.

Grouping of Encoders by Picture Material

If possible, create a group of Encoders carrying a mix of programme types. This is likely to create the conditions required to achieve an optimal group.

It is not advisable to group together all sports or news material. However, in most situations, the grouping of different programme types does not greatly affect the overall performance.

Grouping to Allow for Remultiplexing

The reason the Reflex software has the capability to create multiple statistical multiplexing groups is to allow for remultiplexing of programmes further downstream. If all Encoder bit-streams were in a single group, it could be difficult to remultiplex a sub-group further down the transmission chain.

Protecting Channels

It is possible to set up the weighting and maximum/minimum bit-rates to ensure a quality of service on one or more Encoders. An experienced operator can protect certain chosen channels by careful choice of these parameters thus restraining the total bit-rate demanded by others in the group.

Table 5.5 shows the situation where channel 1 is protected. The maximum bit-rate that Encoders 3 and 4 can demand between them is 10 Mbit/s. This leaves a guaranteed minimum bit-rate of 5 Mbit/s available to Encoders 1 and 2.

Table 5.5: Example of Protected Channels

Encoder	Resolution	Target Picture	Bit-rate (Mbit/s)		
	(pixels)	Quality	Average	Minimum	Maximum
1	704 x 576	95	6.0	1.0	7.5
2	544 x 576	80	4.0	1.0	6.0
3	544 x 576	80	3.0	0.7	5.0
4	544 x 576	80	2.0	0.7	5.0
		TOTAL:	15.0		

5.3 Overview of Audio Coding

5.3.1 MPEG-1 Layer 2

Audio is encoded is to the MPEG-1 encoding standard ISO/IEC 13818-3 (layer 2) at a sampling rate of 32 kHz or 48 kHz.

The spectrum of the received broad-band audio signal is divided into sub-bands of equal bandwidth by filtering. Each of these sub-bands is separately sampled and quantised to convert the input analogue signal into a sequence of discrete sample values. The samples associated with each sub-band are separately coded according to the psychoacoustic properties of the human auditory system. Critical regions are coded more accurately, with less bits being assigned to frequencies at which the ear is less sensitive. Coding is also dependent on dynamic information such as audio masking, in which a loud sound at one frequency dominates over any quieter sounds at adjacent frequencies.

Adaptive Differential Pulse Code Modulation (ADPCM) techniques are used to reduce the bit-rate by coding the difference values between successive samples rather than absolute values. Quantisation step size is adjusted depending on the magnitude of the difference value: a rapid change produces a coarse approximation followed by smaller, more precise successive samples.

For all coding modes (stereo, mono, dual mono and joint stereo) the digitally coded bits are formatted into distinct frames, each of which contains a header which defines the frame in detail (coding scheme, mode, bit-rate, etc.). Since the number of useful bits varies depending on the psychoacoustic properties of the corresponding sound samples, the frame can be padded. The resultant encoded audio output bit-rate is software selectable in the range 32 kbit/s to 384 kbit/s, depending on the mode selected (see *Chapter 1, Introduction* for table of supported bit-rates).

5.3.2 Dolby Digital

Dolby Digital has been designed to take maximum advantage of human auditory masking. It divides the audio spectrum of each channel into narrow frequency bands of different sizes optimised with respect to the frequency selectivity of human hearing. This makes it possible to sharply filter coding noise so that it is forced to stay very close in frequency to the frequency components of the audio signal being coded. By reducing or eliminating coding noise wherever there are no audio signals to mask it, the sound quality of the original signal can be subjectively preserved.

In Dolby Digital, bits are distributed among the filter bands as needed by the particular frequency spectrum or dynamic nature of the program. A built-in model of auditory masking allows the coder to alter its frequency selectivity (as well as time resolution) to make sure that a sufficient number of bits are used to describe the audio signal in each band, thus ensuring noise is fully masked.

Dolby Digital also decides how the bits are distributed among the various channels from a common bit pool. This technique allows channels with greater frequency content to demand more data than sparsely occupied channels, or strong sound in one channel to provide masking for noise in other channels.

5.4 Output Modes

5.4.1 ASI Mode

This is a multiplexed MPEG-2 transport stream with Service Information (SI) data, video, audio and data transport packets. This is a fully compliant stream suitable for connection to any other equipment with an ASI input.

5.4.2 TAXI Mode

This is a TANDBERG Television proprietary mode and used only when connecting to TANDBERG Television multiplexing equipment. In this mode the equipment outputs video, audio and data packets and the SI is generated on the downstream multiplexing equipment. The TAXI link between the multiplexing equipment and the Encoder provides a bi-directional control channel for Reflex commands.

5.5 Noise Reduction

Noise reduction can be selected at either the front panel or by the MCC. By invoking the noise reduction process the Encoder applies sophisticated edge preserving filters on the incoming material which removes the noise and can reduce the encoding difficulty considerably.

5.6 Logo Overlay

To overlay or brand the material with a logo, the logo must first be downloaded into the equipment using the Ethernet TFTP protocol (see *Annex E, Creating and Downloading a Logo*). Once this has been done the logo can be enabled or disabled.

5.7 Encoder Functional Description

5.7.1 Enclosure

The Encoder is constructed in a 2U enclosure. Access to the various modules can be gained by removing the module tray retaining screws and pulling the modules, together with their mounting trays, out from the back of the enclosure. The enclosure has five dc fans for general cooling. At low temperature, the fans are disabled to allow the unit to warm up to operating temperature.

5.7.2 Power Supply Unit

The power supply unit used in this equipment is capable of supplying a maximum of 300 Watts. All models use a nominal 100-120/220-240 Vac input at 60/50 Hz to provide the regulated voltage supplies required by the modules in the Encoder (see *Annex B, Technical Specification,* for details).

The primary power circuit is protected by a fuse which must be selected according to the local mains voltage.

5.7.3 Backplane S8443

The Backplane is mounted toward the front of the Enclosure. It provides three slots for connection to the plug-in modules. All modules mate with the Backplane to allow inter-module communications and power supply distribution.

5.7.4 Overview

Video Encoding Functions

The PAL/NTSC composite video and YP_RP_B component video signals are input to the S8481 Video Input Module where one input is selected, converted to parallel 656 video, and fed to the Video Switch on the S8442 Base Board 3ASI. The input is de-serialised and SDI fed into the same video switch.

One video feed is selected by the Switch and fed to the Preprocessor stage which carries out functions such as down-sampling, frame resynchronising, noise reduction, embedded audio extraction, Teletext/VBI extraction and forward analysis (look ahead to detect scene cuts etc.). The Preprocessor also contains a test pattern generator.

The output of the preprocessing block is still parallel TTL 656 and this is passed to the Video Compression Module (S8860 or S8652, depending on Encoder model). The Video Compression Module performs the MPEG compression process and its output is a stream of MPEG video transport packets at the desired video bit-rate.

Audio Encoding Functions

Audio is handled on the Motherboard where it is input as either analogue or digital AES/EBU, or de-embedded audio from a digital video input. The selected input generates audio samples suitable for compression. Audio compression is performed by a Digital Signal Processor (DSP) which converts the audio samples to various coding standards.

Additional audio inputs can be made using the M2/EOM/AUD Additional Audio Option Module.

Data Handling Functions

The RS-422 and RS-232 data feeds are input to the M2/EOM/DAT Data Input Option Module (if fitted). The data inputs are converted directly to packet streams – they are not compressed.

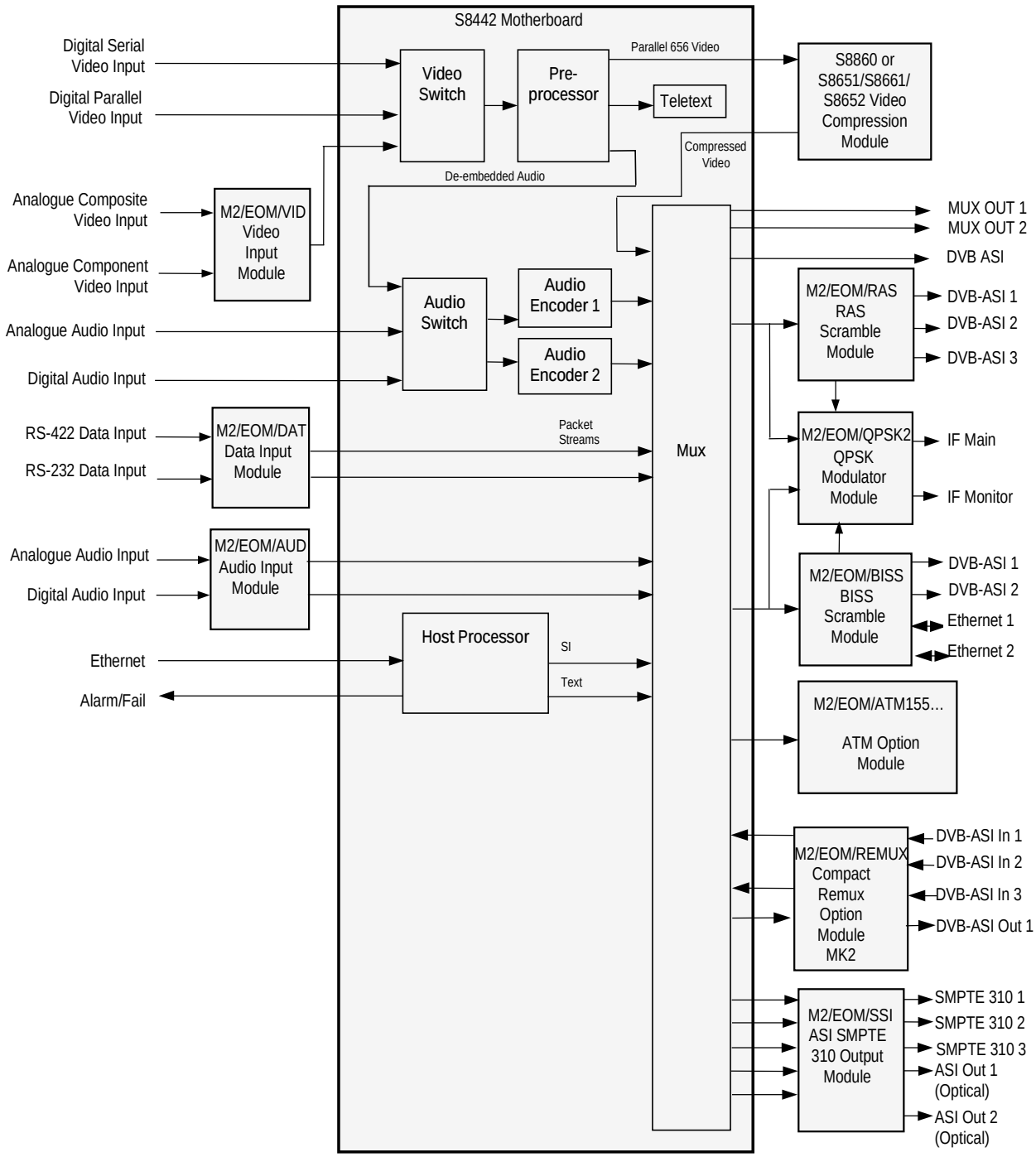

Figure 5.2: Encoder Block Diagram

Serial Digital Video Input Error Detection and Handling

The serial digital video input supports error detection and handling (EDH), which is an error checking method for serial transmitters and receivers. EDH is fully defined in the specification SMPTE RP 165-1994, 'Error Detection Checkwords and Status Flags for Use in Bit Serial Digital Interfaces for Television'.

To check the serial link, three sets of flags are generated at the transmitter and subsequently regenerated at the receiver (i.e. the Encoder) to confirm the link is error free. The sets of flags generated are:

- Full field flags, which are based on the regeneration of a cyclic redundancy check (CRC) checkword calculated over the full field of samples.
- Active picture flags, which are based on the regeneration of a CRC checkword calculated over the active picture.
- Ancillary data checksum flags, which are based on calculating a checksum for all the ancillary data packets within a field.

Errors detected by the Encoder in the serial digital interface are reported as 'EDH ...' errors on the front panel display. Refer to *Chapter 6, Preventive Maintenance and Fault-finding*, for a list and description of these error messages.

Analogue Video Inputs

Analogue video inputs can be made using the M2/EOM/VID Analogue Video Input Option Module.

Inputs/Outputs

The Encoder as a whole is controlled by a processor on the Motherboard. The user inputs to the processor are either on Ethernet or via the front panel.

The output of the unit is a multiplex of video/audio/data and SI packets on ASI.

Multiplexing Function

The Multiplexer receives packet streams from the Video Compression Module, Audio Encoders and Data Input Module. In addition, the Host Processor generates Service Information (SI) packets which are also fed to the Multiplexer. The Multiplexer generates a transport stream from these packet sources, and inserts NULL packets in the transport stream if no data is available.

Remote Authorisation System (RAS) Scrambling

The transport stream is fed to the S8489 RAS CA Module which implements the proprietary Remote Authorisation System (RAS 1). This provides an elementary form of security designed simply to prevent open access to the transmitted service. RAS 1 supports two methods of key entry: SNG key mode and fixed link mode.

In SNG key mode, a seven-digit key is entered via the front panel controls. If the receiver is in tracking mode, one key is entered which is programmed into both the encoder and the receiver. If the receiver is in independent mode, two keys have to be entered, one for the encoder and one for the receiver.

In fixed link mode, an eight digit key is assigned by TANDBERG Television and pre-programmed into the encoder and the receiver.

Basic Interoperable Scrambling System (BISS)

The transport stream is fed to the S11762 BISS CA Module which implements the EBU scrambling system. This provides an elementary form of security designed simply to prevent open access to the transmitted service. BISS supports a number of Modes.

In DVB Key Code mode, a twelve digit key is entered via the front panel controls.

> NOTE...
> This release of BISS corresponds to Tech 3290 March 2000 and BISS-E to Tech 3292 April 2001.

Scrambling PIDs

Scrambling is implemented on the PIDs listed in *Table 5.6*, and can be switched on and off under user control

Table 5.6: PID Scrambling

PIDs Scrambled		PIDs NOT Scrambled	
Packet Type	PID (Hex)	Packet Type	PID (Hex)
Video	0x0134	NULL	0x1FFF
Audio A	0x0100	PCR	0x1FFE
Audio B	0x0101	CA	0x00C0
RS-232 Data	0x0102	PAT	0x0000
RS-422 Data	0x0104	CAT	0x0001
Teletext	0x0111	PMT	0x0020
		NIT	0x0010
		SDT	0x0011
		EIT	0x0012
		TDT	0x0014

The output from the Scrambling Option Module is fed to the Modulator. This is as a synchronous parallel interface using a 204-byte packet format over the Backplane to the internal Modulator Module.

5.7.5 Motherboard (S8442)

Functions

The S8442 Motherboard is responsible for all the non-video compression functions of the Encoder. It has the following main functions.

Host Processor

The host is the main control processor in the Encoder. It is a Motorola 68360 processor running at 33 MHz with external DRAM on SIM and flash for storing code. It communicates with the outside world via an Ethernet, RS-232 port or the front panel and keypad.

At power on, the host boots from the flash, copying its code into DRAM to run. It can be reset if the voltage is too low, or if the switch is pressed, or if it detects a bus error. The host takes instructions from the rest of the world via its interfaces and uses these to control the other elements of the unit. It passes instructions to the other elements through its dual port RAM interfaces. Another task of the host is to generate SI.

Video Switch

The video switch selects between the three possible sources of video; SDI, parallel 656 and analogue video (if option module is fitted).

Preprocessor

The preprocessor operates on the 656 video stream selected by the video switch. It carries out such functions as Teletext extraction, noise reduction, filtering, VBI extraction, test pattern generation and forward prediction (3/2 pull down detection etc.) and embedded audio extraction. The output of the preprocessor is still 656 video ready for encoding, and any extracted AES/EBU audio. The preprocessor communicates with the host via a dual port RAM.

Audio Input and Switch

The audio input consists of two channels, A and B, each capable of AES/EBU digital audio and analogue audio. The analogue input stage performs termination, gain control and Analogue to Digital (A/D) conversion. The output of the A/D converter is I^2S audio.

The digital input is received by an AES/EBU receive chip which converts the input to I^2S which is then passed through an Asynchronous Sample Rate converter. The audio switch chooses from the sources and selects one for compression.

Audio Encoders

The audio encoders are DSP circuits. The DSP has its own RAM and communicates to the host via a dual port RAM. The input to the DSP is I^2S digital audio samples, the output is transport packets written into a First In, First Out (FIFO) buffer.

Multiplexer

The function of the multiplexer is to take all of the individual sources of packets within the unit and form them into a transport stream (video, audio, SI, teletext and data) which is output in one of two possible formats, TAXI or ASI.

5.7.6 E4 Video Compression Module (S8651/S8661/S8652[2])

Microprocessor

The S8651/S8661/S8652 E4 Video Compression Module is controlled by a microprocessor. The microprocessor boots from the flash memory chips. Associated with the microprocessor are an address decoder and local RAM.

The microprocessor communicates with the Motherboard via the dual port RAM. The interface is used to pass information such as bit-rate and line standard between the Motherboard microprocessor and the local microprocessor.

XILINX Integrated Circuit

The XILINX integrated circuit (IC) (via the microprocessor) has overall control of the Video Compression Module. Registers inside the XILINX IC allow various configuration modes etc. to be set.

E4 Compression Chips

The E4 compression chips take video from the Motherboard via a 96-way edge connector. The two E4s (if both are fitted) communicate with each other via a four-bit wide IPC interface. The compressed video data is passed to the rate buffer.

Rate Buffer

The XILINX IC reads the data from the rate buffer in single eight-bit wide words from each of the eight field stores in turn. The data is packetised by the XILINX IC and the resulting packets are written to the output FIFO where the multiplexer can access them.

5.7.7 Hybrid Video Compression Module (S8860[3])

Microprocessor

The S8860 Hybrid Video Compression Module is controlled by a microprocessor. The microprocessor boots from a flash memory chip. Associated with the microprocessor are an address decoder, Programmable Logic Device and local DRAM.

The microprocessor communicates with the Motherboard via the dual port RAM. The interface is used to pass information such as bit-rate and line standard between the Motherboard microprocessor and the local microprocessor.

Field Programmable Gate Array and Digital Signal Processor Integrated Circuits

The Field Programmable Gate Array (FPGA) integrated circuits, along with the Digital Signal Processors (DSP), are responsible for most of the video encoding and are controlled by the main microprocessor.

[2] E5210 and E5410 only.
[3] Hybrid Video Compression Module (S8860) is fitted in the E5610[/48V] only.

Motion Estimation

Dedicated motion estimator ICs are used to perform this important operation.

Chapter 6

Preventive Maintenance and Fault-finding

Contents

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6.1 Introduction

This chapter provides the schedules and instructions, where applicable, for routine inspection, cleaning and maintenance of the equipment which should be performed by an operator. There are also some basic fault-finding procedures to follow in the event of a suspected Encoder failure.

6.2 Preventive Maintenance

6.2.1 Routine Inspection - Cooling Fans

The fans on the Encoder are temperature controlled so may not be on if the ambient temperature is low.

> NOTE...
>
> Failure to ensure a free flow of air around the unit may cause overheating. This condition is detected by a temperature sensor on the Motherboard which causes the alarm relay to be energised.

6.2.2 Cleaning

Unplug the Encoder from the wall outlet before cleaning the exterior with a damp cloth. Do not use liquid cleaners or aerosol cleaners.

> NOTE...
>
> Only the exterior of the case should be cleaned.

6.2.3 Servicing

Damage Requiring Service

WARNING...

DO NOT ATTEMPT TO SERVICE THIS PRODUCT AS OPENING OR REMOVING COVERS MAY EXPOSE DANGEROUS VOLTAGES OR OTHER HAZARDS. REFER ALL SERVICING TO SERVICE PERSONNEL WHO HAVE BEEN AUTHORISED BY TANDBERG TELEVISION.

Unplug the equipment from the wall outlet and refer servicing to qualified service personnel under the following conditions:

1. When the power supply cord or plug is damaged
2. If liquid has been spilled, or objects have fallen into the product
3. If the product has been exposed to rain or water
4. If the product does not operate normally by following the operating instructions
5. If the product has been dropped or the case has been damaged
6. When the product exhibits a distinct change in performance

Replacement Parts

When replacement parts are required, be sure the service technician has used parts specified by the manufacturer or which have the same characteristics as the original part. Unauthorised substitutions may result in fire, electric shock or other hazards.

Checks on Completion of Servicing

Upon completion of any service or repairs to this product, ask the service technician to perform safety checks to determine that the product is in a safe operating condition. Also, performance and EMC checks may be required.

6.3 Maintenance and Support Services

6.3.1 Introduction

TANDBERG Television is a leader in the design, integration and implementation of digital broadcasting products and systems. It has a large team dedicated to keeping our customers on air 24 hours a day, 365 days a year.

With regional offices worldwide, and ultra-modern specialist service facilities in the US, UK, Hong Kong and Australia, TANDBERG Television covers the world. There is a customer service centre open round the clock, every day of the year, in your time zone.

TANDBERG's years of design and support experience enable it to offer a range of service options that will meet your needs at a price that makes sense.

It's called the **TANDBERG Advantage**.

6.3.2 Warranty

All TANDBERG Products and Systems are designed and built to the highest standards and are covered under a comprehensive 12 month warranty.

6.3.3 Levels of Continuing TANDBERG Television Service Support

For standalone equipment, then TANDBERG Television **BASIC Advantage** is the value for money choice for you.
BASIC provides you with year-by-year Service long after the warranty has expired.

For systems support you can choose either **Gold** or **Silver Advantage**. These packages are designed to save you costs and protect your income through enlisting the help of TANDBERG Television support specialists.

Call TANDBERG Sales for more details.

6.4 Using the Errors and Diagnostics Menus

6.4.1 Error Messages

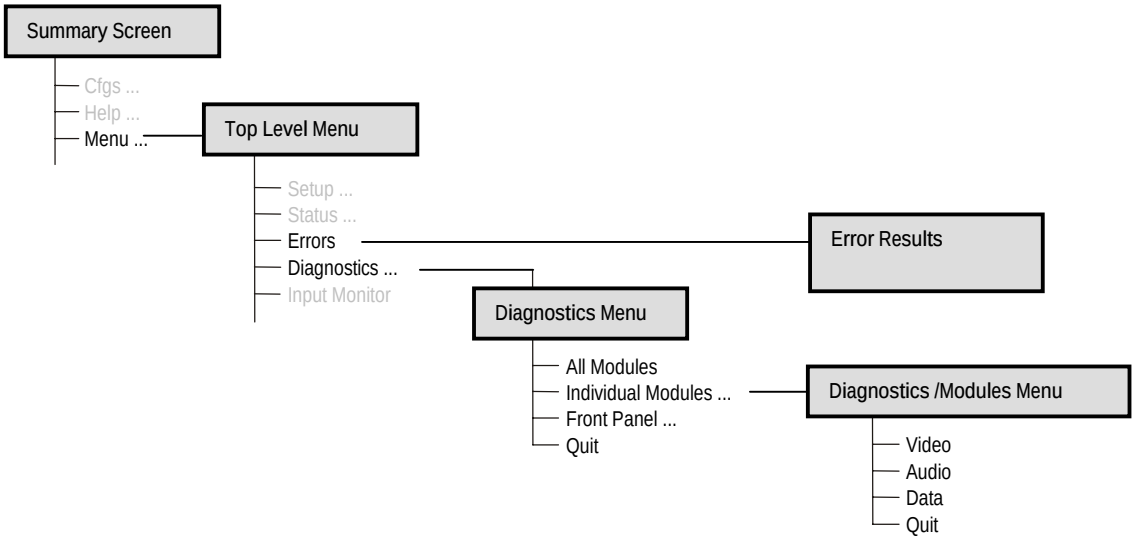


Figure 6.1: Finding the Errors and Diagnostics Menus

Investigate any run-time error by selecting the **Errors** option (see *Figure 6.1*) and displaying the error results.
When there are no errors the words '**There are no errors'** are shown.
If there are errors associated with the equipment then a screen is shown which indicates the error category (alarm/fail), the module affected and text describing the error.

CAUTION...

It does not mean that the Encoder is fully functional if the Error option does not produce any results. Some processes cannot be tested on-line.

NOTE...

This function can be used with the Encoder still in service.

6.4.2 Displaying the Error Message on the LCD

The Encoder can be configured to display an active error message on the front panel LCD. However, the error message is not locked and the LCD reverts to the pre-error display after a short interval.

To set this option:

1. Select the **General** option from the **Setup/System** menu.
2. From the **General** menu, select the **Display Errors** option and set it to **On**.

6.4.3 Encoder Error Messages

Motherboard

Error messages generated by the Motherboard are shown in *Table 6.1*. The table shows whether the error generates a fail or an alarm output. Some of the Motherboard errors are maskable (see *Table 6.1* and *Section 6.4.5*).

Table 6.1: S8442 Motherboard Error Messages

Error Message	Alarm	Fail	Maskable	Action to Take
Audio A Comms		✓		Power off Encoder. Check Base Board 3ASI is firmly seated in the chassis. Power on Encoder. If fault still present, call a Service Engineer.
Audio B Comms		✓		
LCD Auto Status	✓			
LCD Status	✓			
Mux Comms		✓		
Option Module 1 Comms		✓		Power off Encoder. Check Base Board 3ASI and reported Option Module are firmly seated in the chassis. Power on Encoder. If fault still present, call a Service Engineer.
Option Module 2 Comms		✓		
Option Module 3 Comms		✓		
Option Module 4 Comms		✓		
Over Temperature	✓		✓	Check equipment ventilation slots are clear and unobstructed; see *Chapter 2* for details of ventilation requirements. Check ambient air temperature is within specified range; see *Annex B*. If fault still present, call a Service Engineer.
Over Voltage (5V)	✓		✓	Power supply unit output voltage requires adjustment. Call a Service Engineer.
PSU Voltage Sensor Failure	✓		✓	Power Encoder off, then back on again. If fault still present call a Service Engineer.
Real Time Clock Failure	✓		✓	
SCC3 Serial Port	✓		✓	
SCC4 Serial Port	✓		✓	
EDH Anc. Data Error	✓		✓	An ancillary data checksum error was detected in the digital serial link connected to the Encoder.	Check the source of the digital serial link connected to the Encoder SDI video input, and any equipment in the signal path between the source and the Encoder, and all related cables and connectors. If the transmitter (and/or any intervening devices) do not support EDH, then these messages do not indicate a fault with the Encoder. Try to verify the serial link using another receiver. If the link is verified as OK then call Service Engineer for Encoder. If link is suspect or cannot be tested, then fault may lie in data transmitter or the Encoder; investigate further.
EDH Anc. Data Error Already	✓		✓	An ancillary data checksum error was detected in the digital serial link 'upstream' of the Encoder.	
EDH Anc. Data Unknown Error	✓		✓	The status of the ancillary data flags is not known as the serial link is received from a transmitter that does not support EDH.	
EDH Full Field Error	✓		✓	A full field CRC error was detected in the digital serial link connected to the Encoder.	
EDH Full Field Error Already	✓		✓	A full field CRC error was detected in the digital serial link 'upstream' of the Encoder.	
EDH Full Field Unknown Error	✓		✓	The status of the full field flags is not known as the serial link is received from a transmitter that does not support EDH.	
EDH Picture Error	✓		✓	An active picture CRC error was detected in the digital serial link connected to the Encoder.	
EDH Picture Error Already	✓		✓	An active picture CRC error was detected in the digital serial link 'upstream' of the Encoder.	
EDH Picture Unknown Error	✓		✓	The status of the active picture flags is not known as the serial link is received from a transmitter that does not support EDH.	
Temperature Sensor Failure	✓		✓	Power Encoder off, then back on again. If fault still present, call a Service Engineer.

Error Message	Alarm	Fail	Maskable	Action to Take
Under Temperature	✓		✓	Check ambient air temperature is within specified range; see *Annex B*. If fault still present, call a Service Engineer.
Under Voltage (5V)	✓		✓	Power supply unit output voltage requires adjustment. Call a Service Engineer.
Video Encoder Comms		✓		Power off Encoder. Check Base Board 3ASI and Video Compression Module are firmly seated in the chassis. Power on Encoder. If fault still present, call a Service Engineer.
Video Pre-Processor Comms		✓		
Video Input Lock	✓		✓	Check video input is present and the Encoder is configured for the correct line standard.
Wrong Video Line Standard	✓		✓	
No Reflex Messages	✓		✓	During Reflex operation, no messages were received during the set period.

Model E5610 Encoder Error Messages

Table 6.2: Model E5610 Encoder Error Messages

Error Message	Alarm	Fail	Maskable
Config Update	✓		
Encoder Stopped	✓		
Mux Bit Rate Too Low	✓		
Incorrect Parameters	✓		
No Field or Stripe Interrupt		✓	
DSP Overrun		✓	
FPGA/DSP Boot Fail		✓	
Illegal Frame Rate		✓	
Rate Buffer Overflow/Underflow		✓	
DSP Health Failed		✓	
Bad Filter Coefficients	✓		
Repeated PCR Resync	✓		
Fault in Coding Mode	✓		
PCR Resync	✓		✓

Models E5210 and E5410 Encoder Error Messages

Table 6.3: Model E5210, E5410 Encoder Error Messages

Error Message	Alarm
Config Update	✓
Encoder Stopped	✓
Mux Bit Rate Too Low	✓
Incorrect Parameters	✓
PCR Error	✓
Rate Buffer Overflow	✓
E4 Comms Sequence Number	✓
E4 does not respond	✓
Initialisation Error	✓
Rate Buffer Empty	✓

Audio Error Messages

Table 6.4: Audio Error Messages

Error Message	Alarm	
Config Update	✓	
Encoder Stopped	✓	
Incorrect Parameters	✓	
PCR Error	✓	
Silence Timeout Left	✓	
Silence Timeout Right	✓	
Level Clipping Left	✓	✓
Level Clipping Right	✓	✓
Embedded Source 1	✓	
Embedded Source 2	✓	
Embedded Source 3	✓	
Embedded Source 4	✓	

6.4.4 Option Error Messages

M2/EOM/AUD Option Error Messages

See *Table 6.4* for details of Audio option module error messages.

M2/EOM/DAT Option Error Messages

RS-232 Data Input

Table 6.5: M2/EOM/DATRS-232 Error Messages

Error Message	Alarm
RS232 Config Update	✓
Encoder Stopped	✓
RS232 Error 1	✓
RS232 Error 2	✓
RS232 Error 3	✓

RS-422 Data Input

Table 6.6: M2/EOM/DAT RS-422 Error Messages

Error Message	Alarm
RS422 Config Update	✓
Encoder Stopped	✓

M2/EOM/VID Option Error Messages

Table 6.7: M2/EOM/VID Error Messages

Error Message	Alarm
Config Update	✓
Processor Stopped	✓

M2/EOM/QPSK2 Option Error Messages

Table 6.8: M2/EOM/QPSK2 Error Messages

Error Message	Alarm
Modulator Comms	✓
Config Update	✓
Processor Stopped	✓
Hardware Config Error	✓
ALC Error	✓
IF Synthesiser	✓
Symbol Clock Synthesiser	✓
FIFO Fault	✓
Modulation Fault	✓
Input Clock Fault	✓
Parameter Fault	✓
Input Data Fault	✓

M2/EOM/RAS Option Error Messages

Table 6.9: M2/EOM/RAS Error Messages

Error Message	Alarm
Config Update	✓
Processor Stopped	✓
Byte Error (188)"},	✓
Byte Error (204)	✓
DVB Lock Error (188)	✓
DVB Lock Error (204)	✓

M2/EOM/ATM... Option Error Messages

Table 6.10: M2/EOM/QPSK2 Error Messages

Error Message	Alarm
Config Update	✓
Processor Stopped	✓
Tx Loss of Lock	✓
Tx Buffer Overflow	✓
Tx Buffer Underflow	✓
Rx Loss of Lock	✓
Rx Buffer Overflow	✓
Rx Buffer Underflow	✓
Rx Loss of Signal	✓
Rx Loss of Cell Delineation	✓
Rx Bit Error Rate	✓
Unknown Error	✓

Table 6.11: M2/EOM/REMUX Error Messages

Error Message	Alarm
Config Update	✓
Processor Stopped	✓
Overflow Input 1	✓
Overflow Input 2	✓
Overflow Input 3	✓
M-Board Overflow	✓

M2/EOM/SSI Option Error Messages

Table 6.12: M2/EOM/SSI Error Messages

Error Message	Alarm
Config Update	✓
Processor Stopped	✓
Pre FIFO Sync Error	✓
Post FIFO Sync Error	✓

M2/EOM/BISS Option Error Messages

Table 6.13: M2/EOM/BISS Error Messages

Error Message	Alarm
Processor Stopped	✓
Processor Error	✓

6.4.5 Masking Motherboard Alarm and Fail

Some Motherboard alarm and fail status indications can be masked using the Terminal connection (Host Status) at the rear of the unit.

Bring up the Diagnostics menu and then display the mask menu by using the following procedure:

1. Select **b** – Configuration Menus
2. Select **a** – General Box
3. Select **v** – Mask Motherboard Errors

This displays the screen shown in *Figure 6.2*.

```
*******************************************************************************
*           NDS DTH3 ENCODER - BOX CONFIG - Mask Motherboard Errors            *
*******************************************************************************

    < a >  1: Video Input Lock              < m > 13: EDH Full Field Error
    < b >  2: Temperature Sensor Failure    < n > 14: EDH Full Field Unknown Err
    < c >  3: PSU Voltage Sensor Failure    < o > 15: EDH Full Field Error Alrea
    < d >  4: Real Time Clock Failure       < p > 16: EDH Picture Error
    < e >  5: Ethernet Comms                < q > 17: EDH Picture Unknown Error
    < f >  6: Over Temperature              < r > 18: EDH Picture Error Already
    < g >  7: Under Temperature             < s > 19: EDH Anc. Data Error
    < h >  8: Over Voltage (5V)             < t > 20: EDH Anc. Data Unknown Erro
    < i >  9: Under Voltage (5V)            < u > 21: EDH Anc. Data Error Alread
    < j > 10: Wrong Video Line Standard     < v > 25: Closed Caption Comms
    < k > 11: SCC3 Serial Port              < w > 26: Video Genlock
    < l > 12: SCC4 Serial Port              < x > Quit

Current Selection = Quit

Press <Enter> to accept, <Esc> to cancel

Select Option (a-x,Enter,Esc):
```

Figure 6.2: Mask Motherboard Errors Display

When masked, by selecting the letter option, the associated number is replaced by **< m >.**

6.4.6 Masking Audio / Video Errors

Some Audio/Video alarm status indications can be masked using the Terminal connection (Host Status) at the rear of the unit.

Bring up the Diagnostics menu and then display the mask menu by using the following procedure:

1. Type **b** and press ENTER – Configuration Menus
2. Type **a** and press ENTER – General Box
3. Type **y** and press ENTER – Mask Audio/Video Errors

This displays the screen shown in *Figure 6.3*.

```
********************************************************************************
*           NDS DTH3 ENCODER - BOX CONFIG - Mask Audio/Video Errors            *
********************************************************************************

    < a >  1: Video PCR Errors
    < b >  2: Audio A Clip Level
    < c >  3: Audio B Clip Level
    < d >  4: No Reflex Messages


Current Selection = Quit

Press <Enter> to accept, <Esc> to cancel

Select Option (a-d,Enter,Esc):
```

Figure 6.3: Mask Audio/Video Errors Display

When masked, by selecting the letter option, the associated number is replaced by **<m>.**

6.4.7 Diagnostics Menu

Introduction

> CAUTION...
> Take the Encoder off-line and run the diagnostics tests.

The `Diagnostics Menu` is selected from the `Setup Menu` by pressing the **Diagnostics** softkey.

This menu has a selection of diagnostic tests which allow the operator to test the equipment, either as a whole or by the individual component parts.

```
Diagnostics
------------------------------------------------
All Modules           |
Individual Modules    |
Front Panel           |
                      |                    Quit
```

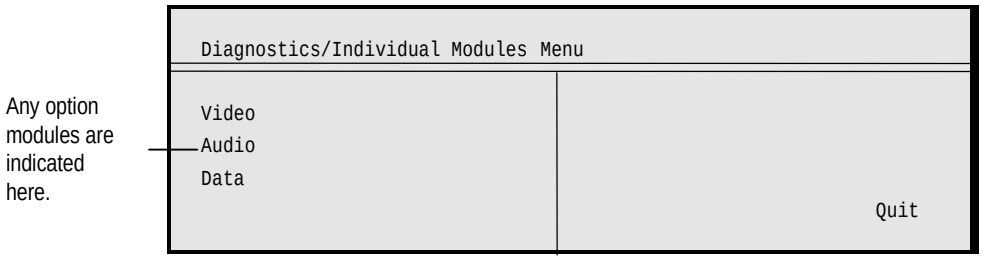
All Modules Option

Press the **All Modules** softkey in the `Diagnostics Menu` to test the unit as a whole. If everything passes then a message ‘All Modules Passed’ is displayed on the screen. If not, the problem area is indicated by a message on the screen.

Individual Modules Menu

The `Individual Modules Menu` is selected from the `Diagnostics Menu` by pressing the **Individual Modules** softkey.

This menu permits the testing of the individual modules of the Encoder.

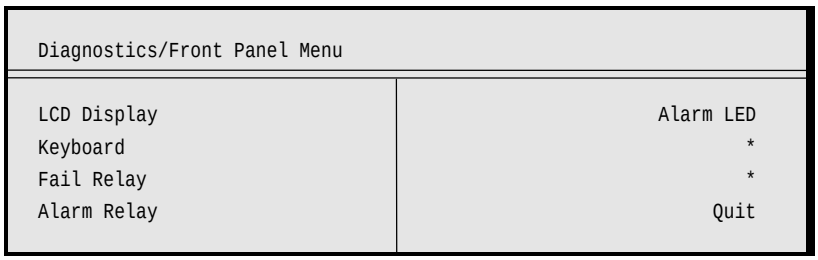


Video/Audio/ Data Option Modules

Press the appropriate softkey in the `Individual Modules Menu` to test the appropriate module. If everything passes then a message 'Module Passed' is displayed on the screen. If not, the message 'Module Failed' is displayed, together with an indication of the problem area. The video and audio options are always displayed but other selections refer to any option modules which may be fitted.

Front Panel Menu

The `Front Panel Menu` is selected from the `Diagnostics Menu` by pressing the **Front Panel** softkey. Press the softkey in the `Front Panel Menu` corresponding to the area to test.



Proceed as follows:

LCD Display Test

Press a key to clear the LCD display, then press a key again to fill the LCD display with black, then again to return to the menu.

Keyboard Test

Press each softkey and keypad key in turn. The display shows the last key pressed. Press the **Quit** softkey twice to return to the menu.

Fail Relay Test

Press any key (except the **Quit** softkey) to toggle the fail relay on and off. Press the **Quit** softkey to return to the menu. The relay can usually be heard clicking as it changes state. The relay is connected to the rear panel **ALARM** connector – see *Chapter 2*, *Installing the Equipment* for the connector pin-out details.

Alarm Relay Test

Press any key (except the **Quit** softkey) to toggle the alarm relay on and off. Press the **Quit** softkey to return to the menu. The relay can usually be heard clicking as it changes state. The relay is connected to the rear panel **ALARM** connector – see *Chapter 2*, *Installing the Equipment* for the connector pin-out details.

Alarm LED

Press any key (except the **Quit** softkey) to toggle the front panel **Alarm** LED on and off. Press the **Quit** softkey to return to the menu.

6.5 Input Monitor

The Input Monitor screen is selected from the Top Level Menu by pressing the **Input Monitor** softkey. The Input Monitor Screen shows a picture of the currently selected video source, the service name of the video channel being encoded, the audio A and B channels in the form of bargraphs, and the multiplexer and video bit-rates.

6.6 Fault-finding

6.6.1 Fault-finding Philosophy

It is the objective of this chapter to provide sufficient information to enable the operator to rectify apparent faults or else to identify the suspect module, where possible. Some basic procedures are provide to follow in the event of a suspected Encoder failure. It is assumed that fault-finding has already been performed at a system level and that other equipment units have been eliminated as the possible cause of the failure (see relevant *System Manual*).

WARNING...

DO NOT REMOVE THE COVERS OF THIS EQUIPMENT. HAZARDOUS VOLTAGES ARE PRESENT WITHIN THIS EQUIPMENT AND MAY BE EXPOSED IF THE COVERS ARE REMOVED. ONLY TANDBERG TELEVISION TRAINED AND APPROVED SERVICE ENGINEERS ARE PERMITTED TO SERVICE THIS EQUIPMENT.

CAUTION...

Do not remove the covers of this equipment. Unauthorised maintenance or the use of non-approved replacements may affect the equipment specification and invalidate any warranties.

This manual does not include any maintenance information or procedures which would require the removal of covers.

If the following information fails to clear the abnormal condition, call a Service Engineer or contact Customer Services using the information given in the preliminary pages of this manual.

6.6.2 Preliminary Checks

Always investigate the failure symptoms fully, prior to taking remedial action. Fault diagnosis for the equipment operator is limited to the following tasks, since the operator should **NOT** remove the covers of the equipment:

1. Check the front panel Power LED. If this is not lit:
   a) Replace the fuse in the power connector at the rear panel (see *User Accessible Fuse Replacement* on *Page 6-15*).

      NOTE...

      Only replace the fuse once. If it blows again contact Customer Services.

   b) Replace external equipment, power source and cables by substitution to check their performance.

2. Confirm that the equipment hardware configuration is suitable for the purpose and has been correctly installed and connected (see *Chapter 2, Installing the Equipment*).
3. Confirm that inappropriate operator action is not causing the problem, and that the equipment software set-up is capable of performing the task being asked of it. If the validity of the configuration, set-up or operation is in doubt, check it (see *Chapter 4, Operating the Encoder Locally*).
4. Check that the fans are unobstructed and working correctly.

When the failure condition has been fully investigated, and the symptoms are known, proceed with fault-finding according to the observed symptoms. If the fault persists, and cannot be rectified using the instructions given in this manual, contact Customer Services. Switch off the equipment if it becomes unusable, or to protect it from further damage.

6.6.3 User Accessible Fuse Replacement

AC Fuse Information

A fuse is held in an integral fuse carrier at the ac power inlet at the rear panel.

Table 6.14: Fuse Information

Item	Specification
Fuse position	Fuse in live conductor in power input filter at rear of unit
Fuse size	5 x 20 mm
Fuse current rating, voltage, type	5 A, 250 Vac T HBC

> NOTE...
> Refer to *Annex B, Section B.5, Power Supply* for more information.

AC Fuse Replacement

To replace the ac power fuse:

> WARNING...
> BEFORE REPLACING THE REAR PANEL FUSE, DISCONNECT THE UNIT FROM THE SUPPLY. FAILURE TO DO THIS MAY EXPOSE HAZARDOUS VOLTAGES. UNPLUG THE UNIT FROM THE LOCAL SUPPLY SOCKET.

1. Ensure that power is turned off and the power cable is disconnected from the ac power inlet.
2. Ease out the fuse carrier by placing a small, flat-bladed screwdriver in the notch at the top of the carrier.

> CAUTION...
> When replacing the power input fuse, always ensure that a fuse of the correct type and rating, is fitted. Failure to do so results in inadequate protection.

3. Replace the fuse in the carrier.
4. Insert the fuse carrier back in the ac power inlet.

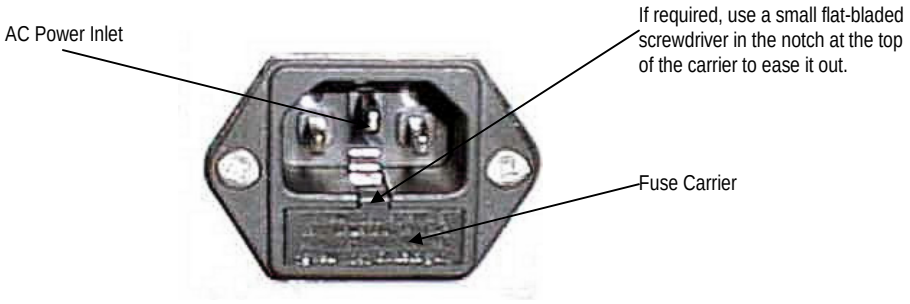


Figure 6.4: Orientation of Fuse Carrier

If the replacement fuse also blows, do not continue. Disconnect the equipment and contact Customer Services for advice.

DC Fuse Information

Table 6.15: DC Fuse Information

Item	Specification
Fuse	Fitted in the power input filter at rear of unit.
Fuse type	5 mm x 20 mm anti-surge (T)
Fuse rated current	6.3 A, (T) HBC
Fuse rated voltage	250 Vac

NOTE...

Refer to *Annex B, Technical Specification, Section B.5, Power Supply* for more information.

DC Fuse Replacement

WARNING...

BEFORE REPLACING THE REAR PANEL FUSE, ISOLATE THE UNIT FROM THE SUPPLY. FAILURE TO ISOLATE THE EQUIPMENT PROPERLY MAY CAUSE A SAFETY HAZARD.

To replace the dc power fuse:

1. Ensure that dc power is turned off or the power cable is disconnected from the power inlet.
2. Unscrew the fuse carrier and remove the old fuse (see *Figure 6.5*).

CAUTION...

When replacing the power input fuse, always ensure that a fuse of the correct type and rating, is fitted. Failure to do so results in inadequate protection.

3. Insert the new fuse in the carrier.
4. Insert the fuse carrier back in the dc power inlet.

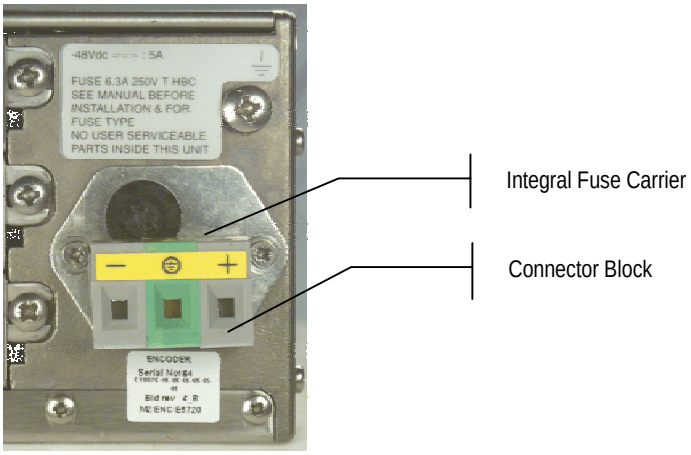


Figure 6.5: Connector Block for -48 Vdc Input

6.6.4 Video Fault-finding

Fault Symptoms

Table 6.16: Video Fault-finding

Problem	What to do
Video amplitude wrong	Check video termination (see *Chapter 4, Operating the Equipment Locally - `Setup/Video/Source Menu`*).
Video input lock error	Check video input.
Video - wrong line standard	Check video input.
Encoder stopped	Processor has stopped running.
Incorrect parameters	Check set-up.
Illegal frame rate	Check set-up.

Excessive Video Errors

When changing between configurations in an Encoder equiped with M2/EOM1/Remux and M2/EOM1/QPSK2 option modules, problems may occasionally be experienced which cause considerable video errors to be generated.

In this case, simply go to `setup/video/video encoder` and reduce the video bit-rate. This can be by at little as 10 kbit/s. Afterwards the original bit-rate may be re-selected if desired.

Overflow Error

If an overflow error (Setup/Mux/Services) is indicated then the remux services exceed the output bit-rates.

1. If output bit-rate is <45.5 Mbit/s change to 45.5 Mbit/s.
2. If the output bit-rate is already 45.5 Mbit/s reduce the video bit-rates at contributing Encoders.

> NOTE...
> It is advisable to have at least 0.75 Mbit/s free in the output.

Breaks in Transmission

If a transitory break in transmission occurs then check the encoding mode option of the Encoder (see *Chapter 4, Operating the Equipment Locally*).

In the standard and low delay encoding modes, bit-rate and GOP changes are not seamless. This is because the Encoder tries to maintain minimal end-to-end delay (latency) and that means buffer sizes must be as small as possible. In the standard and low delay encoding modes the buffer size is selected by the video bit-rate. Changing the bit-rate changes the buffer size, requiring a reset of the coding process.

For reflex operation video bit-rate changes must be seamless as the bit-rate varies continuously. The E5610 has six seamless encoding modes. These cover three broad ranges of bit-rate to provide seamless operation in different applications.

All the seamless modes are seamless only for video bit-rate changes. However, for some GOP changes operation can be seamless, but this aspect is not guaranteed.

Noise Reduction

Where incoming picture material is corrupted by high frequency noise (such as white noise) it is advisable to make use of the noise reduction process. Noise reduction can be selected at either the front panel or by the MEM.

6.6.5 Mux Fault-finding

If there is no output from the ASI connectors, check the following:

1. The bit-rate - if it is too low then the video etc. is automatically switched off.
2. The packet length - should be 188 or 204 bytes depending upon configuration.

6.7 Rate Buffer Setting

The E5410/E5610 Encoders, when running in 4:2:2 mode, have two software selectable rate buffer modes; small and medium.

When transmitting 4:2:2 mode into systems using the earlier System 3000 PRO IRD M2/PSR/3/422BAS then the rate buffer mode of the Encoder must be set to 'small'.

However, when operating into an Alteia the rate buffer mode of the Encoder must be set to ‘medium’ (default size).

When operating in mixed environments, both the Alteia and the Encoder must be changed to small buffer mode.

> NOTE...
>
> These settings can be changed using the VT100 not the front panel menus. Contact Customer Services for advice (see *Preliminary Pages*).

Table 6.17: Rate Buffer Settings

	E5410/E5610[/48V] Setting	Alteia Setting
PRO IRD	SMALL	-
Alteia only	MEDIUM	MEDIUM
Alteia and PRO IRD	SMALL	SMALL

6.8 Field/Frame Pictures

Some receivers are unable to decode field pictures. Select the **Frame** option the **Field/Frame Pic Auto Option** (Model E5610 only), does the fault clear? If not, contact Customer Services.

6.9 Power Supply Problems/Green LED on Front Panel Unlit

6.9.1 Symptoms

WARNING...

DO NOT ATTEMPT TO SERVICE THE POWER SUPPLY UNIT AS OPENING OR REMOVING COVERS MAY EXPOSE DANGEROUS VOLTAGES OR OTHER HAZARDS. REFER ALL SERVICING TO SERVICE PERSONNEL WHO HAVE BEEN AUTHORISED BY TANDBERG TELEVISION.

Use the following techniques to fault-find the Encoder according to the observed symptom(s) when a power supply failure is suspected.

6.9.2 Power LED Unlit

If the Encoder Power LED is unlit, fault-find the problem as detailed in *Table 6.18*.

Table 6.18: Power LED Unlit Fault-finding

Step	Action	If Result of Action is Yes...	If Result of Action is No...
1	**Check Power LED**. Is the Encoder still working?	If the Encoder is clearly working normally then the **Power LED** itself is probably at fault. Call a Service Engineer.	Proceed to next step.
2	**Check Power Source**. Connect a known-working piece of equipment to the power source outlet. Does it work?	The problem lies within the Encoder or power cable. Proceed to next step.	The problem lies with the power source. Check building circuit breakers, fuse boxes, etc. If problem persists, contact the electricity supplier.
3	**Check Power Cable and Fuse**. Unplug the power connector from the Encoder and try it in another piece of equipment. Does it work?	The problem lies within the Encoder. Proceed to next step.	The problem lies with either the cable itself, or with the fuse in the plug. Replace the fuse or try to substitute another cable.
4	**Check PSU Module and Fuse**. Ensure the power connector is unplugged. Remove the fuse from the rear panel connector and inspect it. Has the fuse blown?	Replace the fuse with one of the correct type and rating (see *Annex B Technical Specification)*. If the PSU still does not work, unplug the power cable and call a Service Engineer.	Possible problem with the PSU module. Call a Service Engineer.

6.9.3 Fan(s) Not Working/Overheating

The fans are disabled at low temperature to allow the unit to quickly attain operational temperature. In the event of overheating problems, refer to *Table 6.19*.

> NOTE...
>
> Failure to ensure a free air flow around the unit may cause overheating. This condition is detected by a temperature sensor on the Motherboard which may be used to trigger an automatic alarm.

Table 6.19: Fans Not Working/Overheating

Step	Action	If Result of Action is Yes...	If Result of Action is No...
1	**Check Fan Rotation**. Inspect the fans located at the sides of the enclosure. Are the fans rotating? Check Motherboard temperature and fan status on LCD status menu	Check that the Encoder has been installed with sufficient space allowed for air flow (see *Chapter 2, Installing the Equipment*). If the ambient air is too hot, additional cooling may be required.	Possible break in the dc supply from the PSU module to the suspect fan(s). Call a Service Engineer.

6.10 Disposing of this Equipment

6.10.1 General

Dispose of this equipment safely at the end of its life. Local codes and/or environmental restrictions may affect its disposal. Regulations, policies and/or environmental restrictions differ throughout the world. Contact your local jurisdiction or local authority for specific advice on disposal.

6.10.2 Lithium Batteries

The equipment uses the Dallas Semiconductor NVRAM DS1644-1Z. This component contains a Lithium battery. This cell is not a USA Environmental Protection Agency listed hazardous waste. It is fully encapsulated and should not be tampered with.

BLANK

Annex A

Glossary

The following list covers most of the abbreviations, acronyms and terms as used in TANDBERG Television Limited Manuals. All terms may not be included in this manual.

µm	Micrometre (former name - micron): a unit of length equal to one millionth (10^{-6}) of a metre.
3:2 pulldown	A technique used when converting film material (which operates at 24 pictures per second) to 525-line video (operating at 30 pictures per second).
4:2:0	Digital video coding method in which the colour difference signals are sampled on alternate lines at half the luminance rate.
4:2:2	Digital video coding method in which the colour difference signals are sampled on all lines at half the luminance rate.
5B6B	5 Binary Bits Encoded to 6 Binary Bits: Block code.
ac	Alternating Current.
ADPCM	Adaptive Differential Pulse Code Modulation: An advanced PCM technique that converts analogue sound into digital data and vice versa. Instead of coding an absolute measurement at each sample point, it codes the difference between samples and can dynamically switch the coding scale to compensate for variations in amplitude and frequency.
ACC	Authorisation Control Computer.
ADT	Audio, Data And Teletext.
AFC	Automatic Frequency Control.
AFS	Automation File Server.
AGC	Automatic Gain Control.
AMOL I and II	Automatic Measure of Line-ups I and II: Used by automated equipment to measure programme-viewing ratings.
ASI	Asynchronous Serial Interface.
ASIC	Application-Specific Integrated Circuit: A customised chip designed to perform a specific function.
Async	Asynchronous.
ATM	Asynchronous Transfer Mode: A connection orientated, cell based, data transport technology designed for Broadband ISDN (B-ISDN). It provides a circuit-switched bandwidth-on-demand carrier system, with the flexibility of packet switching. It offers low end-to-end delays and (negotiable on call set-up) Quality of Service guarantees. Asynchronous refers to the sporadic nature of the data being transmitted. Cells are transmitted only when data is to be sent, therefore the time interval between cells varies according to the availability of data.
ATSC	Advanced Television Standards Committee: An organisation founded in 1983 to research and develop a digital TV standard for the U.S.A. In late 1996, the FCC adopted the ATSC standard, the digital counterpart of the NTSC standard.
B3ZS	Bipolar with Three Zero Substitution: A method of eliminating long zero strings in a transmission. It is used to ensure a sufficient number of transitions to maintain system synchronisation when the user data stream contains an insufficient number of 1s to do so. B3ZS is the North American equivalent of the European HDB3.

Backward Compatibility	Refers to hardware or software that is compatible with earlier versions.
BAT	Bouquet Association Table: Part of the service information data. The BAT provides information about bouquets. It gives the name of the bouquet and a list of associated services.
baud rate	The rate of transfer of digital data when the data comprises information symbols that may consist of a number of possible states. Equivalent to bit-rate when the symbols only have two states (1 and 0). Measured in Baud.
BER	Bit Error Rate: A measure of transmission quality. The rate at which errors occur in the transmission of data bits over a link. It is generally shown as a negative exponent, (e.g., 10^{-7} means that 1 in 10,000,000 bits are in error).
BISS	Basic Interoperable Scrambling System: Non-proprietary encryption from EBU (Tech3290).
Bit-rate	The rate of transfer of digital data when the data comprises two logic states, 1 and 0. Measured in bit/s.
Block; Pixel Block	An 8-row by 8-column matrix of luminance sample values, or 64 DCT coefficients (source, quantised, or dequantised).
Bouquet	A collection of services (TV, radio, and data, or any combination of the three) grouped and sold together, and identified in the SI as a group. A single service may be in several bouquets.
B-Picture; B-Frame	Bi-directionally Predictive Coded Picture/Frame: A picture that is coded using motion-compensated prediction from previous I or P frames (forward prediction) and/or future I or P frames (backward prediction). B frames are not used in any prediction.
BPSK	Binary Phase Shift Keying: A data modulation technique.
Buffer	A memory store used to provide a consistent rate of data flow.
BW	Bandwidth: The transmission capacity of an electronic line such as (among others) a communications network, computer bus, or broadcast link. It is expressed in bits per second, bytes per second or in Hertz (cycles per second). When expressed in Hertz, the frequency may be a greater number than the actual bits per second, because the bandwidth is the difference between the lowest and highest frequencies transmitted. High bandwidth allows fast transmission or high-volume transmission.
CA	Conditional Access: The technology used to control the access to viewing services to authorised subscribers through the transmission of encrypted signals and the programmable regulation of their decryption by a system such as viewing cards.
CAT	Conditional Access Table: Part of the DVB Service Information data. The CAT identifies the PID in which conditional access management data (EMMs) is being carried, per CA provider.
C-Band	The portion of the electromagnetic spectrum, which spans the frequency range of approximately 4 GHz to 6 GHz. Used by communications satellites. Preferred in tropical climates because it is not susceptible to fading.
CCIR	*See:* ITU-R.
CCITT	*See:* ITU-T.
Channel	A narrow range of frequencies, part of a frequency band, for the transmission of radio and television signals without interference from other channels. In the case of OFDM, a large number of carriers spaced apart at precise frequencies are allocated to a channel.
Channel Coding	A way of encoding data in a communications channel that adds patterns of redundancy into the transmission path in order to improve the error rate. Such methods are widely used in wireless communications.
Chrominance	The colour part of a TV picture signal, relating to the hue and saturation but not to the luminance (brightness) of the signal. In a composite-coded colour system, the colour information (chrominance, often referred to as chroma) is modulated onto a high frequency carrier and added to the monochrome-format video signal carrying the luminance (Y). In a component-coded colour system, the two colour-difference signals (R-Y)(B-Y) usually referred to as C_RC_B (digital) or P_RP_B (analogue), are used to convey colour information. When C_RC_B (P_RP_B) is added to the luminance (Y), the complete picture information is conveyed as YC_RC_B (YP_RP_B).
Closed Captioning	A TV picture subtitling system used with 525-line analogue transmissions.
Codec	The combination of an Encoder and a complementary Decoder located respectively at the input and output of a transmission path.
COFDM	Coded OFDM: COFDM adds forward error correction to the OFDM transmission consisting of Reed-Solomon (RS) coding followed by convolutional coding to add extra bits to the transmitted signal. This allows a large number of errors at the receive end to be corrected by convolutional (Viterbi) decoding followed by RS decoding.
Compression	Reduction in the number of bits used to represent the same information. For the purposes of a broadcast system, it is the process of reducing digital picture information by discarding redundant portions of information that are not required when reconstituting the picture to produce viewing clarity. Compression allows a higher bite-rate to be transmitted through a given bandwidth.
Compression System	Responsible for compressing and multiplexing the video / audio / data bit-streams, together with the authorisation stream. The multiplexed data stream is then ready for transmission.

C_RC_B	Digital Colour difference signals. These signals, in combination with the luminance signal (Y), define the colour and brightness of each picture element (pixel) on a TV line.
CRC	Cyclic Redundancy Check: A mathematical algorithm that computes a numerical value based on the bits in a block of data. This number is transmitted with the data and the receiver uses this information and the same algorithm to ensure the accurate delivery of data by comparing the results of algorithm and the number received. If a mismatch occurs, an error in transmission is presumed.
dB	Decibels: A ratio of one quantity to another using logarithmic scales to give results related to human aural or visual perception. dB is a ratio whereas dBm, for example, is an absolute value, quoted as a ratio to a fixed point of 0 dBm. 0 dBm is 1 mW at 1 kHz terminated in 600Ω. 0 dBmV is 1 mV terminated in 75Ω.
DCE	Data Communications Equipment: Typically a modem. It establishes, maintains and terminates a session on a network but in itself is not the source (originator) or destination (end receiving unit) of signals (e.g. a computer, see DTE). A DCE device may also convert signals to comply with the transmission path (network) format.
DCT	Discrete Cosine Transform: A technique for expressing a waveform as a weighted sum of cosines. Raw video data is not readily compressible. DCT is not in itself a compression technique but is used to process the video data so that it is compressible by an encoder. DCT processes the picture on an 8x8-pixel block basis, converting the data from an uncompressible X Y form (as displayed by an oscilloscope) to a compressible frequency domain form (as displayed by a spectrum analyser). Can be forward DCT or inverse DCT.
DDS	Direct Digital Synthesiser.
Decoder	The unit containing the electronic circuitry necessary to decode encrypted signals. Some Decoders are separate from the receiver but in satellite TV broadcasting, the term is often used interchangeably as a name for an Integrated Receiver Decoder (IRD). The term IRD, or IRD / Decoder, is usually associated with satellite TV broadcasting while Cable systems are based on Converters or on Set-Top Boxes / Converters.
Decoding Time-stamp	A field that may be present in a PES packet header that indicates the time that an access unit is to be decoded in the system target Decoder.
DID	Data Identifier.
Differential Coding	Method of coding using the difference between the value of a sample and a predicted value.
DIL	Dual In Line: The most common type of package for small and medium scale integrated circuits. The pins hang vertically from the two long sides of the rectangular package, spaced at intervals of 0.1 inch.
DIN	Deutsches Institut für Normung: German Standards Institute.
Downlink	The part of the satellite communications circuit that extends from the satellite to an Earth station.
Downconvert	The process by which the frequency of a broadcast transport stream is shifted to a lower frequency range.
DPCM	Differential Pulse Code Modulation: An audio digitisation technique that codes the difference between samples rather than coding an absolute measurement at each sample point.
DSNG	Digital Satellite News-Gathering.
DSP	Digital Signal Processor.
DTE	Data circuit Terminating Equipment: A communications device that originates (is the source) or is the end receiving unit (destination) of signals on a network. It is typically a terminal or computer.
DTH	Direct To Home. The term used to describe uninterrupted transmission from the satellite directly to the subscriber, that is, no intermediary cable or terrestrial network utilised.
DVB	Digital Video Broadcasting: A European project which has defined transmission standards for digital broadcasting systems using satellite (DVB-S), cable (DVB-C) and terrestrial (DVB-T) medium, created by the EP-DVB group and approved by the ITU. Specifies modulation, error correction, etc. (see EN 300 421 for satellite, EN 300 429 for cable and EN 300 744 for terrestrial).
DVB SI	Digital Video Broadcasting Service Information.
DVB-PI	DVB-Professional Interfaces: TTV Lan search shows – DVB Physical Interfaces
Earth	Technical Earth: Ensures that all equipment chassis within a rack are at the same potential, usually by connecting a wire between the Technical earth terminal and a suitable point on the rack. This is sometimes known as a Functional earth. Protective Earth: Used for electric shock protection. This is sometimes known as a safety earth.
EBU	European Broadcast Union.
ECM	Entitlement Control Message.
EIA	Electronics Industries Association (USA).
EIT	Event Information Table: A component of the Service Information (SI) stream which contains information about events or programmes such as event name, start time, duration, etc.
Elementary Stream	A generic term for a coded bit-stream, be it video, audio or other.

EMC	Electromagnetic Compatibility.
EMM	Entitlement Management Message.
Encryption	Encoding of a transmission to prevent access without the appropriate decryption equipment and authorisation.
Ethernet	The most widely used local area network (LAN) defined by the IEEE as the 802.3 standard. Transmission speeds vary according to the configuration. Ethernet uses copper or fibre-optic cables.
ETS	European Telecommunications Standard.
ETSI	European Telecommunications Standards Institute.
FCC	Federal Communications Commission.
FDM	Frequency Division Multiplex: A common communication channel for a number of signals, each with its own allotted frequency.
FEC	Forward Error Correction: A method of catching errors in a transmission. The data is processed through an algorithm that adds extra bits and sends these with the transmitted data. The extra bits are then used at the receiving end to check the accuracy of the transmission and correct any errors.
FFT	Fast Fourier Transformation: A fast algorithm for performing a discrete Fourier transform.
FIFO	First In, First Out: A data structure or hardware buffer from which items are taken out in the same order they were put in. Also known as a shelf from the analogy with pushing items onto one end of a shelf so that they fall off the other. A FIFO is useful for buffering a stream of data between a sender and receiver that are not synchronised - i.e. they not sending and receiving at exactly the same rate.
Footprint	The area of the Earth's surface covered by a satellite's downlink transmission. Also (generally) the area from which the satellite can receive uplink transmissions.
FTP	File Transfer Protocol: A protocol used to transfer files over a TCP/IP network (Internet, UNIX, etc.). For example, after developing the HTML pages for a Web site on a local machine, they are typically uploaded to the Web server, using FTP. Unlike e-mail programs in which graphics and program files have to be attached, FTP is designed to handle binary files directly and does not add the overhead of encoding and decoding the data.
G.703	The ITU-T standard which defines the physical and electrical characteristics of hierarchical digital interfaces.
GOP	Group of Pictures: MPEG video compression works more effectively by processing a number of video frames as a block. The TANDBERG Television Encoder normally uses a 12 frame GOP; every twelfth frame is an I frame.
GUI	Graphical User Interface: The use of pictures rather than just words to represent the input and output of a program. A program with a GUI runs under a windowing system and has a screen interface capable of displaying graphics in the form of icons, drop-down menus and a movable pointer. The on-screen information is usually controlled / manipulated by a mouse or keyboard.
HDTV	High Definition Television.
HPA	High Power Amplifier: Used in the signal path to amplify the modulated and up-converted broadcast signal for feeding to the uplink antenna.
HSYNC	Horizontal (line) SYNCs.
Hub	A device in a multipoint network at which branch nodes interconnect.
ICAM	Integrated Conditional Access Module: Embedded in the IRD and responsible for descrambling, plus packet filtering and reception. It also contains the physical interface to the subscriber's viewing card.
IEC	International Electrotechnical Committee.
IF	Intermediate Frequency: Usually refers to the 70 MHz or 140 MHz output of the Modulator in cable, satellite and terrestrial transmission applications.
Interframe Coding	Compression coding involving consecutive frames. When consecutive frames are compared, temporal redundancy is used to remove common elements (information) and arrive at difference information. MPEG-2 uses B and P frames, but since they are individually incomplete and relate to other adjacent frames, they cannot be edited independently.
Intraframe Coding	Compression coding involving a single frame. Redundant information is removed on a per frame basis. All other frames are ignored. Coding of a macroblock or picture that uses information only from that macroblock or picture. Exploits spatial redundancy by using DCT to produce I frames; these are independent frames and can be edited.
IP	Internet Protocol: The IP part of TCP/IP. IP implements the network layer (layer 3) of the protocol, which contains a network address and is used to route a message to a different network or sub-network. IP accepts packets from the layer 4 transport protocol (TCP or UDP), adds its own header to it and delivers a datagram to the layer 2 data link protocol. It may also break the packet into fragments to support the Maximum Transmission / Transfer Unit (MTU) of the network.
I-picture; I-frame	Intracoded Picture/Frame: A picture / frame, which is coded using purely intracoding with reference to no other field or frame information. The I frame is used as a reference for other compression methods.
IPPV	Impulse Pay Per View: One-time events, purchased at home (on impulse) using a prearranged SMS credit line.

IRD	Integrated Receiver Decoder: The Receiver with an internal MPEG Decoder, which is connected to the subscriber's TV. The IRD is responsible for receiving and de-multiplexing all signals. The unit receives the incoming signal and if CA is active, decodes the signal when provided with a control word by the viewing card. Domestic IRDs are also known as Set-Top Units or Set-Top Boxes.
IRE	Institute of Radio Engineers: No longer in existence but the name lives on as a unit of video amplitude measurement. This unit is 1% of the range between blanking a peak white for a standard amplitude signal.
ISDN	Integrated Services Digital Network: The basic ISDN service is BRI (Basic Rate Interface), which is made up of two 64 kbit/s B channels and one 16 kbit/s D channel (2B+D). If both channels are combined into one, called bonding, the total data rate becomes 128 kbit/s and is four and a half times the bandwidth of a V.34 modem (28.8 kbit/s). The ISDN high-speed service is PRI (Primary Rate Interface). It provides 23 B channels and one 64 kbit/s D channel (23B+D), which is equivalent to the 24 channels of a T1 line. When several channels are bonded together, high data rates can be achieved. For example, it is common to bond six channels for quality videoconferencing at 384 kbit/s. In Europe, PRI includes 30 B channels and one D channel, equivalent to an E1 line.
ISO	International Standards Organisation.
ISOG	Inter-union Satellite Operations Group.
ITS	Insertion Test Signal: A suite of analogue test signals placed on lines in the VBI. Also known as VITS.
ITT	Invitation To Tender.
ITU-R	International Telecommunications Union - Radiocommunications Study Groups (was CCIR).
ITU-T	International Telecommunications Union - Telecommunications Standardisation Sector (was CCITT).
JPEG	Joint Photographic Experts Group: ISO/ITU standard for compressing still images. It has a high compression capability. Using discrete cosine transform, it provides user specified compression ratios up to around 100:1 (there is a trade-off between image quality and file size).
kbit/s	1000 bits per second.
Kbit	1024 bits, usually refers to memory capacity or allocation.
Ku-band	The portion of the electromagnetic spectrum, which spans the frequency range of approximately 12 GHz to 14 GHz. Used by communications satellites. Preferred for DTH applications because this range of frequency is less susceptible to interference.
LAN	Local Area Network: A network, which provides facilities for communications within a defined building or group of buildings in close proximity.
L-band	The frequency band from 950 MHz to 2150 MHz, which is the normal input-frequency-range of a domestic IRD. The incoming signal from the satellite is down-converted to L-band by the LNB.
LED	Light Emitting Diode.
LNB	Low Noise Block Down-Converter: The component of a subscriber satellite transmission receiving dish which amplifies the incoming signal and down-converts it to a suitable frequency to input to the IRD (typically 950 MHz - 1600 MHz).
LO	Local Oscillator.
LSB	Least significant bit.
Luminance	The television signal representing brightness, or the amount of light at any point in a picture. The Y in YC_RC_B.
LVDS	Low Voltage Differential Signal: LVDS is a generic multi-purpose Interface standard for high speed / low power data transmission. It was standardised in ANSI/TIA/EIA-644-1995 Standard (aka RS-644).
Macroblock	A 16x16-pixel area of the TV picture. Most processing within the MPEG domain takes place with macro blocks. These are converted to four 8x8 blocks using either frame DCT or field DCT. Four 8 x 8 blocks of luminance data and two (4:2:0 chrominance format), four (4:2:2) or eight (4:4:4) corresponding 8 x 8 blocks of chrominance data coming from a 16 x 16 section of the luminance component of the picture. Macroblock can be used to refer to the sample data and to the coded representation of the sample values and other data elements.
Mbit/s	Million bits per second.
MCC	Multiplex Control Computer: A component of a System 3000 compression system. The MCC sets up the configuration for the System 3000 Multiplexers under its control. The MCC controls both the main and backup Multiplexer for each transport stream.
MCPC	Multiple Channels Per Carrier.
MEM	Multiplex Element Manager: A GUI based control system, part of the range of TANDBERG Television compression system control element products. The evolution 5000 MEM holds a model of the system hardware. Using this model, it controls the individual system elements to configure the output multiplexes from the incoming elementary streams. The MEM monitors the equipment status and controls any redundancy switching.

MMDS	Multichannel Microwave Distribution System: A terrestrial microwave direct-to-home broadcast transmission system.
Motion Compensation	The use of motion vectors to improve the efficiency of the prediction of sample values. The prediction uses motion vectors to provide offsets into the past and/or future reference frames or fields containing previously decoded sample values that are used to form the prediction error signal.
Motion Estimation	The process of estimating motion vectors in the encoding process.
Motion Vector	A two-dimensional vector used for motion compensation that provides an offset from the co-ordinate position in the current picture or field to the co-ordinates in a reference frame or field.
MP@ML	Main Profile at Main Level: A subset of the MPEG-2 standard, which supports digital video storage (DVD etc.) and transmissions up to 15 Mbit/s over various mediums.
MP@HL	Main Profile at High Level: A subset of the MPEG-2 standard, which supports digital video storage (DVD etc.) and transmissions up to 80 Mbit/s over various mediums.
MPEG	Moving Pictures Experts Group: The name of the ISO/IEC working group which sets up the international standards for digital television source coding.
MPEG-2	Industry standard for video and audio source coding using compression and multiplexing techniques to minimise video signal bit-rate in preparation for broadcasting. Specified in ISO/IEC 13818. The standard is split into layers and profiles defining bit-rates and picture resolutions.
MSB	Most significant bit.
Msymbol/s	(Msym/s) Mega (million) Symbols per second (10^6 Symbols per second).
Multiplex	A number of discrete data streams (typically 8 to 12), from encoders, that are compressed together in a single DVB compliant transport stream for delivery to a Modulator.
MUSICAM	Masking pattern adapted Universal Sub-band Integrated Coding And Multiplexing: An audio bit-rate reduction system relying on sub-band coding and psychoacoustic masking.
Mux	Multiplexer: Transmission Multiplexer: receives EMMs from the ACC, ECMs from the BCC, video/audio data from the encoders, and the SI stream from the SIC. It then multiplexes them all into a single DVB-compliant transport stream, and delivers the signal to the uplink after modulation. The Multiplexer also contains the cypher card, which scrambles the services according to the control words supplied by the BCC.
Network	In the context of broadcasting: a collection of MPEG-2 transport stream multiplexes transmitted on a single delivery system, for example, all digital channels on a specific cable system.
NICAM	Near Instantaneously Companded Audio Multiplex: Official name is NICAM 728. Used for digital stereo sound broadcasting in the UK employing compression techniques to deliver very near CD quality audio. 728 refers to the bit-rate in kbit/s.
NIT	Network Information Table: Part of the service information data. The NIT provides information about the physical organisation of each transport stream multiplex, and the characteristics of the network itself (such as the actual frequencies and modulation being used).
nm	Nanometre: a unit of length equal to one thousand millionth (10^{-9}) of a metre.
NTSC	National Television Systems Committee: The group, which developed analogue standards used in television broadcast systems in the United States. Also adopted in other countries (e.g. Mexico, Canada, Japan). This system uses 525 picture lines and a 59.97 Hz field frequency.
NVOD	Near Video On Demand: Method of offering multiple showings of movies or events. The showings are timed to start at set intervals, determined by the broadcaster. Each showing of a movie or event can be sold to subscribers separately.
NVRAM	Non-volatile Random Access Memory: Memory devices (permitting random read / write access) that do not lose their information when power is removed. Stores the default configuration parameters set by the user.
OFDM	Orthogonal FDM: A modulation technique used for digital TV transmission in Europe, Japan and Australia; more spectrally efficient than FDM. In OFDM, data is distributed over a large number of carriers spaced apart at precise frequencies. The carriers are arranged with overlapping sidebands in such a way that the signals can be received without adjacent channel interference.
OPPV	Order ahead Pay Per View: An advance purchase of encrypted one-time events with an expiry date.
OSD	On-screen display: Messages and graphics, typically originating from the SMS, and displayed on the subscriber's TV screen by the IRD, to inform the subscriber of problems or instruct the subscriber to contact the SMS.
Packet	A unit of data transmitted over a packet-switching network. A packet consists of a header followed by a number of contiguous bytes from an elementary data stream.

PAL	Phase Alternating Line: A colour TV broadcasting system that uses 625 picture lines and a 50 Hz field frequency. The phase of the colour-difference is inverted on every alternate line to provide consistent colour reproduction.
PAT	Program Association Table: Part of the service information data. For each service in the multiplex, the PAT carries the basic mapping of all the data in the transport stream, associating each programme with a Program Map Table.
PCM	Pulse Code Modulation: A process in which a signal is sampled, each sample is quantised independently of other samples, and the resulting succession of quantised values is encoded into a digital signal.
PCR	Program Clock Reference: A time-stamp in the transport stream from which the Decoder timing is derived.
PDC	Program Delivery Control: A Teletext service allowing simple programming (i.e. VideoPlus) of VCR recording times. If the desired program is rescheduled, PDC updates the programming information in the VCR.
Pel	Picture Element: Also known as a pixel. The smallest resolvable rectangular area of an image either on a screen or stored in memory. On screen, pixels are made up of one or more dots of colour. Monochrome and grey-scale systems use one dot per pixel. For grey-scale, the pixel is energised with different intensities, creating a range from dark to light (a scale of 0-255 for an eight-bit pixel). Colour systems use a red, green and blue dot per pixel, each of which is energised to different intensities, creating a range of colours perceived as the mixture of these dots. If all three dots are dark, the result is black. If all three dots are bright, the result is white.
PES	Packetised Elementary Stream: A sequential stream of data bytes that has been converted from original elementary streams of audio and video access units and transported as packets. Each PES packet consists of a header and a payload of variable length and subject to a maximum of 64 kbytes. A time-stamp is provided by the MPEG-2 systems layer to ensure correct synchronisation between related elementary streams at the Decoder.
PID	Packet Identifier: The header on a packet in an elementary data stream, which identifies that data stream. An MPEG-2 / DVB standard.
PIN	Personal Identification Number: A password used to control access to programming and to set purchase limits. Each subscriber household can activate several PINs and may use them to set individual parental rating or spending limits for each family member.
Pixel	PIX (picture) Element: The digital representation of the smallest area of a television picture capable of being delineated by the bit-stream. See Pel for more information.
pk-pk	peak to peak: Measurement of a signal or waveform from its most negative point to its most positive point.
PLL	Phase-Locked Loop. A phase-locked loop is a control system which controls the rotation of an object by comparing its rotational position (phase) with another rotating object as in the case of a sine wave or other repeating signal. This type of control system can synchronise not only the speed, but also the angular position of two waveforms that are not derived from the same source.
PMT	Program Map Table: Part of the Service Information data. Each programme has a PMT, which lists the component parts (the elementary streams of video, audio, etc.) for the various programmes being transmitted.
P-picture/P-frame	A picture / frame produced using forward prediction. It contains predictions from either previous I frames or previous P frames. The P frame is used as a reference for future P or B frames.
ppm	Parts per million.
PPV	Pay Per View: A system of payment for viewing services based on a usage / event basis rather than on on-going subscription. Subscribers must purchase viewing rights for each PPV event that they wish to view. PPV events may be purchased as IPPV or OPPV.
Program	PC - A sequence of instructions for a computer. TV - A concept having a precise definition within ISO 13818-1 (MPEG-2). For a transport stream, the timebase is defined by the PCR. The use of the PCR for timing information creates a virtual channel within the stream.
Programme	A linking of one or more events under the control of a broadcaster. For example, football match, news, film show. In the MPEG-2 concept, the collection of elementary streams comprising the programme, have a common start and end time. A series of programmes are referred to as events.
P_RP_B	Analogue Colour difference signals. Refer to C_RC_B for an explanation.
PROM	Programmable Read-Only Memory: A device, which may be written once with data for permanent storage, and then read whenever required. Special types of PROM permit the erasure of all data by Ultraviolet light (EPROM) or by application of an electronic signal (EEPROM).
PS	Program Stream: A combination of one or more PESs with a common timebase.
PSI	Program Specific Information: Consists of normative data, which is necessary for the demultiplexing of transport streams and the successful regeneration of programs. (*See also:* SI).
PSIP	Program System Information Protocol: The ATSC equivalent of SI for DVB.
PSK	Phase Shift Keying: A method of modulating digital signals particularly suited to satellite transmission.

PSR	Professional Satellite Receiver: *See also:* IRD.
PSU	Power Supply Unit.
QAM	Quadrature Amplitude Modulation: A method of modulating digital signals, which uses combined techniques of phase modulation and amplitude modulation. It is particularly suited to cable networks.
QPSK	Quadrature Phase Shift Keying: A form of phase shift keying modulation using four states.
QSIF	Quarter Screen Image Format.
Quantise	A process of converting analogue waveforms to digital information. 8-bit quantisation as set out in ITU-R Rec. 601. uses 256 levels in the range 0 – 255 to determine the analogue waveform value at any given point. The value is then converted to a digital number for processing in the digital domain.
RAM	Random Access Memory: A volatile storage device for digital data. Data may be written to, or read from, the device as often as required. When power is removed, the data it contains is lost.
RAS	Remote Authorization System: A TANDBERG TV proprietary public-key encryption system used to prevent unauthorized viewing of a TV programme or programmes.
RF	Radio Frequency.
ROM	Read Only Memory: A non-volatile storage device for digital data. Data has been stored permanently in this device. No further information may be stored (written) there and the data it holds cannot be erased. Data may be read as often as required.
RS	Reed-Solomon coding: An error detection and correction, coding system. 16 bytes of Reed-Solomon Forward Error Correction code are appended to the packet before transmission bringing the packet length to 204 bytes. The 16 bytes are used at the receiving end to correct any errors. Up to eight corrupted bytes can be corrected.
RLC	Run Length Coding: Minimisation of the length of a bit-stream by replacing repeated characters with an instruction of the form 'repeat character *x y* times'.
SCPC	Single Channel Per Carrier.
Spectral Scrambling	A process (in digital transmission) used to combine a digital signal with a pseudo-random sequence, producing a randomised digital signal that conveys the original information in a form optimised for a broadcast channel.
Scrambling	Alteration of the characteristics of a television signal in order to prevent unauthorised reception of the information in clear form.
SDT	Service Description Table: Provides information in the SI stream about the services in the system; for example, the name of the service, the service provider, etc.
SELV	Safety Extra Low Voltage (EN 60950).
STB	Set-Top Box: A box that sits on top of a television set and is the interface between the home television and the cable TV company. New technologies evolving for set-top boxes are video-on-demand, video games, educational services, database searches, and home shopping. The cable equivalent of the IRD.
SFN	Single Frequency Network: The SFN technique allows large geographic areas to be served with a common transmission multiplex. All transmitters in the network are synchronously modulated with the same signal and they all radiate on the same frequency. Due to the multi-path capability of the multi-carrier transmission system (COFDM), signals from several transmitters arriving at a receiving antenna may contribute constructively to the total wanted signal. The SFN technique is not only frequency efficient but also power efficient because fades in the field strength of one transmitter may be filled by another transmitter.
SI	Service Information: Digital data describing the delivery system, content and scheduling/timing of broadcast data streams. SI data provides information to enable the IRD to automatically demultiplex and decode the various streams of programmes within the multiplex. Specified in ISO/IEC 13818[1].
Smart Card	A plastic card with a built-in microprocessor and memory used for identification, financial transactions or other authorising data transfer. When inserted into a reader, data is transferred to and from the host machine or a central computer. It is more secure than a magnetic stripe card and it can be disabled if the wrong password is entered too many times. As a financial transaction card, it can be loaded with digital money and used in the same way as cash until the balance reaches zero. The file protocol is specific to its intended application.
SMATV	Satellite Mast Antenna Television: A distribution system, which provides sound and television signals to the households of a building or group of buildings, typically used to refer to an apartment block.
SMPTE	Society of Motion Picture and Television Engineers.
SMS	Subscriber Management System: A system which handles the maintenance, billing, control and general supervision of subscribers to conditional access technology viewing services provided through cable and satellite broadcasting. An SMS can be an automatic (e.g. Syntellect) system where subscribers order entitlements by entering information via a telephone. Alternatively, an SMS can be a manual system, which requires subscribers to speak with an operator who then manually enters their entitlement requests. Some systems support multiple SMSs.

SNG	Satellite News-Gathering.
SNMP	Simple Network Management Protocol.
Spatial Redundancy	Information repetition due to areas of similar luminance and/or chrominance characteristics within a single frame. Removed using DCT and Quantisation (Intra-Frame Coding).
SPI	Synchronous Parallel Interface.
Statistical Redundancy	Data tables are used to assign fewer bits to the most commonly occurring events, thereby reducing the overall bit-rate. Removed using Run Length Coding and Variable Length Coding.
TAXI	Transparent Asynchronous Tx / Rx Interface: A proprietary high-speed data interface.
TCP / IP	Transmission Control Protocol/Internet Protocol: A set of communications protocols that may be used to connect different types of computers over networks.
TDM	Time Division Multiplex: One common, communications channel carrying a number of signals, each with its own allotted time slot.
TDT	Time and Date Table: Part of the DVB Service Information. The TDT gives information relating to the present time and date.
Temporal Redundancy	Information repetition due to areas of little or no movement between successive frames. Removed using motion estimation and compensation (Inter-Frame Coding).
Time-stamp	A term that indicates the time of a specific action such as the arrival of a byte or the presentation of a presentation unit.
Transport Stream	A set of packetised elementary data streams and SI streams, which may comprise more than one programme, but with common synchronisation and error protection. The data structure is defined in ISO/IEC 13818-1 [1] and is the basis of the ETSI Digital Video Broadcasting standards.
Transport Stream Packet Header	A data structure used to convey information about the transport stream payload.
TS	Transport Stream.
TSP	Transport Stream Processor.
U	44.45 mm (rack height standard).
UART	Universal Asynchronous Receiver Transmitter: A device providing a serial interface for transmitting and receiving data.
Upconvert	The process by which the frequency of a broadcast transport stream is shifted to a higher frequency range.
Uplink	The part of the communications satellite circuit that extends from the Earth to the satellite.
UPS	Uninterruptable Power Supply: A method of supplying backup power when the electrical power fails or drops to an unacceptable voltage level. Small UPS systems provide battery power for a few minutes; enough to power down the computer in an orderly manner. This is particularly important where write back cache is used. Write back cache is where modified data intended for the disk is temporarily stored in RAM and can be lost in the event of a power failure. Sophisticated systems are tied to electrical generators that can provide power for days. UPS systems typically provide surge suppression and may provide voltage regulation.
UTC	Universal Time Co-ordinate: An internationally agreed basis for timekeeping introduced in 1972 and based on international atomic time (corresponds to Greenwich Mean Time or GMT).
VITS	Vertical Interval Test Signal: *See:* ITS.
VPS	Video Programming System: A German precursor to PDC
WSS	Wide Screen Switching: Data used in wide-screen analogue services, which enables a receiver to select the appropriate picture display mode.
WST	World System Teletext: System B Teletext. Used in 625 line / 50 Hz television systems (ITU-R 653).
XILINX	A type of programmable Integrated Circuit.
Y (Luminance)	Defines the brightness of a particular point on a TV line. The only signal required for black and white pictures.

BLANK

Annex B

Technical Specification

Contents

List of Tables

B.1 Inputs

B.1.1 International Television Standards

Table B.1 shows television standards appropriate to the Encoder.

Table B.1: International Television Standards

As indicated in Menus:	M	M	N - combination		B/G	I
Region	USA/Japan		Argentina (combination) Jamaica/Uruguay (normal)	---------- Europe / Asia ----------		UK
Standard	NTSC	---------- PAL ----------				
Lines / frame	525	525	625	625	625	625
Fields / second	60	60	50	50	50	50
Interlace	2/1	2/1	2/1	2/1	2/1	2/1
Frames / second	30 (29.97)	30 (29.97)	—	25	25	25
Lines / second	15 750	15 750	15 625	15 625	15 625	15 625
Aspect ratio	4 / 3	4 / 3	4 / 3	4 / 3	4 / 3	4 / 3
Video band (MHz)	4.2	4.2	4.2	5.0	5.0	5.5
RF band (MHz)	6.0	6.0	6.0	7.0	8.0	8.0

B.1.2 Video

Parallel

Table B.2: Parallel Video Specification

Item	Specification
Safety status:	SELV
Connector designation:	PARALLEL
Connector type:	25-way D-type female
Input standard (UK/EEC):	ITU-R BT.656-4 Part 3, Component Video Signals in 525-Line and 625-Line Television Systems Operating at the 4:2:2 Level of Recommendation ITU-R BT.601 (Part A)
Input standard (USA):	ANSI / SMPTE 125M - Component Video Signal 4:2:2 Bit Parallel Digital Interface
Input level:	ECL-compatible, 2 V pk-pk maximum
Int. Test Pattern Generator:	All ITU-R BT. 656 codes

Teletext Extraction

Teletext is extracted from the Vertical Blanking Interval (VBI) of the active video signal.

SDI

Table B.3: Serial Digital Video Specification

Item	Specification
Safety status:	SELV
Connector designation:	SDI IN
Connector type;	BNC female socket
Input standard (UK/EC): Input standard (USA):	ITU-R BT.656 Part 3, Bit Serial Interface 4:2:2 YC_BC_R ANSI / SMPTE 259M Level C - 270 Mbit/s, 525/625 component
Cable length:	250 m, maximum
Input level:	800 mV pk-pk nominal ±10%
Return loss:	>-15 dB, 10-270 MHz

B.1.3 Audio

Analogue and Digital Audio

Table B.4: Analogue and Digital Audio Specification

Item	Specification
Safety status:	SELV
Connector designation:	AUDIO IN
Connector type:	15-way, D-type male connector
Encoding standard:	MPEG-2 ISO/IEC 13818-3 (layer 2)
Input standard (digital)	AES/EBU digital (selectable)
Sampling rate:	32/44.1/48 kHz (selectable)
Input rate:	32, 44.1, 48 kHz
Coding standard (1):	MPEG-2 (layer 2)
Supported coding modes:	Single channel, dual channel, joint stereo and normal stereo
Supported coded data rate:	32-384 kbit/s
Coding standard (2):	Dolby Digital
Termination:	110 Ω
Coding standard (3):	Pre-encoded Dolby AC-3
Coding standard (4):	Dolby E
Coding standard (5):	Linear PCM
Input standard (analogue)	Balanced analogue
Clip level:	12 dB or 18 dB
Input impedance:	600 Ω or 20 kΩ (selectable). 600 Ω = default

CAUTION...

When the unit is not powered the analogue audio input defaults to AES/EBU with 110 Ω termination.

Embedded Audio

Audio embedded on the serial/parallel digital video input can also be extracted and encoded. Up to four stereo pairs of audio can be extracted from the SDI.

Table B.5: Embedded Audio Specification

Item	Specification
Serial Digital Interface	
Safety status:	SELV
Connector designation:	SDI
Connector type:	BNC female connector
Input standard (UK/EEC):	ITU-R BT.656-4 Part 3, Bit Serial Interface 4:2:2 YC_BC_R
Input standard (USA):	ANSI / SMPTE 259M Level C - 270 Mbit/s, 525/625 component
Parallel Digital Interface	
Safety status:	SELV
Connector designation:	PARALLEL
Connector type:	25-way D-type female
Input standard (UK/EEC):	ITU-R BT.656-4, Component Video Signals in 525-Line and 625-Line Television Systems Operating at the 4:2:2 Level of Recommendation ITU-R BT.601 (Part A)
Input standard (USA):	ANSI / SMPTE 125M - Component Video Signal 4:2:2 Bit Parallel Digital Interface

B.2 Outputs

B.2.1 DVB ASI Out

Table B.6: ASI Out Specification

Item	Specification
Safety status:	SELV
Connector type:	BNC 75 Ω
Connector designation:	ASI OUT 1, ASI OUT 2, ASI OUT 3

B.2.2 MUX IN/OUT

This is used when connecting to TANDBERG Television multiplexing equipment.

Table B.7: MUX IN/OUT Specification

Item	Specification
Safety status:	SELV
Connector designation:	MUX IN/OUT 1 and MUX IN/OUT 2
Connector type:	9-way D-type female
Format:	Serial encoded data and clocks carrying communications between Encoder and Multiplexer
Channel rate:	162 Mbit/s
Data rate:	up to 52 Mbit/s
Coding:	5B/6B NRZ1 10-bit data, 12-bit pattern

B.3 Control and Monitoring

B.3.1 Remote Control

Table B.8: Ethernet Specification

Item	Specification
Connector designation:	ETHERNET 1 and ETHERNET 2
Connector type:	8-way RJ-45 socket, 10BaseT (ISO 882/3)

B.3.2 Local Control

Local control is by means of the front panel keypad and LCD display.

B.3.3 Alarm

Table B.9: Alarm Specification

Item	Specification
Safety status:	SELV
Connector designation:	ALARM
Connector type:	9-way D-type male
Alarm contacts:	Change-over contacts (5 Ω in common)
Fail contacts:	Change-over contacts (5 Ω in common)
Reset contacts:	Short pins 9 and 5

B.3.4 Host Status

This is a test-only output and is not normally intended for operator use, since status data is normally communicated via a remote controller, where used.

Table B.10: Host Status Specification

Item	Specification
Safety status:	SELV
Connector designation:	HOST STATUS
Connector type:	9-way D-type male

B.3.5 Remote

This connector provides an RS-232/RS-485 user interface control port which is intended for future use.

B.4 Test Tones

Table B.11: Test Tones Specification

Item	Specification
Level:	6.87 dB at 18 dB system gain
Frequency:	1 kHz at 48 kHz sampling frequency

B.5 Power Supply

B.5.1 AC Mains Input

This equipment is fitted with a wide-ranging power supply. It is suitable for supply voltages of 100-120 Vac -10% +6% or 220-240 Vac -10% +6% at 50/60 Hz nominal.

Table B.12: AC Power Supply Specification

Item	Specification
Power distribution system:	Type TN ONLY (EN 60950 para 1.2.12.1): Power distribution system having one point directly earthed, the exposed conductive parts of the installation being connected to that point by protective earth conductors. This equipment must NOT be used with single-phase three-wire and PE, TT or IT Type Power distribution systems.
Connection to supply:	Pluggable Equipment Type A (EN 60950 para 1.2.5): Equipment which is intended for connection to the building power supply wiring via a non-industrial plug and socket-outlet or a non-industrial appliance coupler or both. Correct mains polarity must always be observed. Do not use reversible plugs with this equipment.
Class of equipment:	Class I Equipment (EN 60950 para 1.2.4): electric shock protection by basic insulation and protective earth.
Rated voltage:	100-120/220-240 Vac (single phase)
Rated frequency:	50/60 Hz
Voltage selection:	Wide-ranging
Rated current:	4 A (100-120 Vac range) 2 A (220-240 Vac range)
Input connector:	CEE 22/IEC 3-pin male receptacle
Fuse:	Fuse in live conductor in power input filter at rear of unit. Do not use reversible plugs with this equipment.
Fuse type: 5 x 20 mm	IEC127 Sheet V e.g.: Bussmann S505 series Littelfuse 215 series
Fuse current rating:	5 A 250 V T HBC
Power consumption:	250 W maximum E5100/AC only: in stand-by mode the unit draws ≤ 18 W

B.5.2 DC Supply Input (-48V version)

Table B.13: DC Power Supply Specification

Item	Specification
Rated voltage:	For connection to –48 Vdc supplies only. (PSU input tolerance –40 to –63 Vdc). Correct polarity must always be observed.
Rated current:	5A
Input connector:	Terminal block
Fuse:	Fuse in –48 Vdc conductor at rear of unit.
Fuse type: 5 x 20 mm	IEC127 Sheet V e.g.: Bussmann S505 series Littelfuse 215 series
Fuse current rating:	6.3 A 250 V T HBC
PSU power consumption:	250 VA nominal

B.6 Physical Details

Table B.14: Physical Details

Item	Specification
Height:	88.9 mm 2U chassis
Width:	442.5 mm excluding fixing brackets
Overall width:	482.6 mm including fixing brackets
Depth:	499.5 mm excluding rear connector clearance
Approximate weight:	12 kg (26.4 lbs)
Rack-mount case:	19 inch width, 2U height

B.7 Environmental Conditions

Table B.15: Environmental Specification

Item	Specification
Operational	
Temperature: Encoders - models E5x10	0°C to +40°C (32°F to 104°F) ambient with free air-flow
Relative humidity:	0% to 90% (non-condensing)
Cooling requirements:	Front section: Cool air input from front panel, exhaust from right side panel Rear section: Cool air input from right side panel, exhaust from left side panel
Handling/movement:	Designed for fixed use when in operation
Storage/Transportation	
Temperature:	0°C to +70°C (32°F to 158°F)
Relative humidity:	0% to 90% (non-condensing)

B.8 Compliance[1]

B.8.1 Safety

This equipment has been designed and tested to meet the requirements of the following:

EN 60950	European	Safety of information technology equipment including business equipment.
IEC 60950	International	Safety of information technology equipment including business equipment.

In addition, the equipment has been designed to meet the following:

UL 1950	USA	Safety of information technology equipment including business equipment.

B.8.2 EMC[2]

The equipment has been designed and tested to meet the following:

EN 55022 and AS/NZS 3548	European Australia and New Zealand	Emission Standard Limits and methods of measurement of radio frequency interference characteristics of information technology equipment - Class A.
EN 61000-3-2[3]	European	Electromagnetic Compatibility (EMC), Part 3 Limits; Section 2. Limits for harmonic current emissions (equipment input current ≤ 16 A per phase).
EN 55024	European	Generic Immunity Standard Part 1: Domestic, commercial and light industry environment.
FCC	USA	Conducted and radiated emission limits for a Class A digital device, pursuant to the Code of Federal Regulations (CFR) Title 47-Telecommunications, Part 15: Radio frequency devices, subpart B – Unintentional Radiators.

B.8.3 Telecommunications

The ATM Interface Module is intended for connection to digital network termination points of point to point services presenting an ITU-T recommendation, G.957 optical interface, operating at STM-1 data rates. The ATM Interface Module fitted within the Encoder is within the scope of the R&TTE Directive, 1999/5/EC, and fulfils the essential requirements of safety and EMC by complying with the standards in *Section B.8.1, Safety,* and *Section B.8.2, EMC*.

[1] The version of the standards shown is that applicable at the time of manufacture.
[2] The EMC tests were performed with the Technical Earth attached, and configured using recommended cables.
[3] Applies only to models of the Encoder using ac power sources.

B.8.4 CE Marking

The CE mark is affixed to indicate compliance with the following directives:

89/336/EEC of 3 May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility.

73/23/EEC of 19 February 1973 on the harmonisation of the laws of the Member States relating to electrical equipment designed for use within certain voltage limits.

1999/5/EC of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity.

> NOTE...
> The CE mark was first affixed to this product in 2000.

B.8.5 C-Tick Mark

The C-Tick mark is affixed to denote compliance with the Australian Radiocommunications (Compliance and Labelling – Incidental Emissions) Notice made under s.182 of Radiocommunications Act 1992.

> NOTE...
> The C-Tick mark was first affixed to this product in 2000.

B.9 Option Modules

B.9.1 M2/EOM/VID Analogue Video Input Module

Analogue Video Specification

Table B.16: Analogue Video Specification

Item	Specification
Analogue input:	625 line composite PAL-I, -B, -G, -D, -M or N 525 line composite NTSC-M as specified in ITU-R report 624-4 “Characteristics of Television Systems”
Connector designation:	Y/COMP, C_R and C_B
Connector type:	75 Ω BNC socket
Input level:	1 V pk-pk nominal ±5%
Return loss:	>30 dB up to 6 MHz (when impedance is set to 75 Ω)

> NOTE...
> The inputs are isolated from the chassis to prevent 50 Hz/60 Hz hum (only Issue 2 and above of the S8481).

Video Performance Figures

Table B.17: System Video Performance Figures

Signal Performance	PAL/Input (Composite)	NTSC/Input (Composite)	Component/Input
Input return loss:	35 dB	35 dB	35 dB
Luminance bandwidth:	5.5 MHz	5.5 MHz	5.5 MHz
C_R, C_B bandwidth:	System dependent	System dependent	C_R, C_B = 2.75 MHz
Luminance non-linearity:	1%	1%	1%
C_R, C_B non-linearity:	1%	1%	1%
Signal to noise ratio:	>55.6 dB	>55.6 dB	>55.6 dB
K2T pulse response:	<1%K	<1%K	<1%K
K-p/b:	1%	1%	1%
Kbar:	0.05%K	0.05%K	0.05%K
Subcarrier rejection:	40 dB	40 dB	40 dB
Y/C timing error:	10 ns	10 ns	10 ns
Jitter over 1 field:	±2.5 ns	±2.5 ns	±2.5 ns

B.9.2 M2/EOM/AUD Audio Option Module

See *B.1.2 Audio*.

B.9.3 M2/EOM/DAT Data Input Option Module

Asynchronous Data Inputs

A 9-way, D-type female connector provides an RS-232 asynchronous, serial communications data input interface.

Table B.18: RS-232 Asynchronous Data Input Specification

Item	Specification
Type:	ITU-T V.24/V.28 (RS-232D) asynchronous serial data
Connector designation:	ASYNC
Connector type:	9-way D-type female
Supported baud rates:	1200, 2400, 4800, 9600, 19200, 38400 baud
Control mechanism:	XON/XOFF
Time-stamp:	Not supported

Synchronous Data Input

A 15-way, D-type female connector provides an RS-422 synchronous, serial communications data input interface.

Table B.19: RS-422 Synchronous Data Input Specification

Item	Specification
Type:	ITU-T V.11 (RS-422), synchronous serial data and external clock
Connector designation:	SYNC
Connector type:	15-way D-type female
Clock frequencies:	n x 64 kbit/s from 64 kbit/s to 2048 kbit/s (selectable) or n x 56 kbit/s from 56 kbit/s to 1792 kbit/s (selectable)
Time-stamp:	Not supported
Operation modes:	Bit-pipe - Transport packet alignment and byte alignment relative to the incoming bit-stream are arbitrary.

B.9.4 M2/EOM/RAS RAS CA Module

Table B.20: DVB ASI 1, 2 and 3 Specification

Item	Specification
Safety status:	SELV
Connector type:	BNC 75 Ω
Connector designation:	DVB ASI 1, DVB ASI 2, DVB ASI 3

B.9.5 M2/EOM/BISS BISS CA Module

DVB-ASI OUT Connector

Table B.21: DVB-ASI OUT Connector

Item	Specification
Safety status	SELV
Connector designation	DVB-ASI OUT n
Connector impedance	75 Ω
Packet size	188 / 204 bytes
Data rate	0.5 Mbit/s to 54 Mbit/s

10BaseT Ethernet Connector

Table B.22: Ethernet Connector

Item	Specification
Safety status	SELV
Connector designation	Ethernet
Data coding	Manchester Coding
Specification	Complies with IEEE Standard 802.3i 1990 for Twisted Pair Ethernet
Max cable length	Typically 100 metres (CAT-5 UP)

B.9.6 M2/EOM/QPSK2 Frequency Agile QPSK Modulator Option Module

Table B.23: IF Out Main Specification

Item	Specification			
Safety status:	SELV			
Connector designation:	IF OUT MAIN			
Connector type:	BNC, female 75 Ω			
Output impedance:	75 Ω			
Return loss:	>18 dB, 35 < f < 105 MHz			
Output power:	–20 to +5 dBm in 0.1 dB steps			
Power level stability:	±0.5 dB			
Signal type:	QPSK per EN 300 421			
Symbol-rate (minimum)	0.46875 Msymbol/s			
Symbol rate (maximum) vs carrier frequency Fc:	Fc (MHz)	50-60	60-80	80-90
	Symbol-rate Msymbol/s	Fc – 30	30	110 – Fc
Transmit symbol-rate accuracy:	Within 15 ppm			
Convolutional FEC rates:	1/2, 2/3, 3/4, 5/6 and 7/8			
Bit-rate (204 byte format:	2 x Rs x FEC Mbit/s where Rs = Symbol-rate (Msymbol/s) FEC = FEC ratio (values listed above)			
Power spectrum:	Square root raised cosine, α = 0.35 per EN 300 421			
Power spectrum (detail, nominal):	Bandwidth/Rs ratio (BW/Rs) at power spectral density Co values (dB) relative to the power spectral density Coo at the carrier (centre) frequency: Co-Coo (dB) BW/Rs -3 1.0 -6 1.13 -10 1.21 -20 1.32 -30 1.37			
Carrier frequency Fc:	50 – 90 MHz			
Carrier frequency step:	125 kHz			
Carrier frequency accuracy:	Within ± 7.5 kHz			
Carrier suppression:	>40 dB			
IF spectrum inversion:	Selectable on/off			
Residual carrier, carrier OFF state:	< -70 dBm			

Item	Specification
Spurious outputs, modulated carrier:	< -60 dBc/4 kHz relative to unmodulated carrier, 0 < f < 500 MHz excluding ±1.06 × Symbol Rate about the carrier frequency
Spurious outputs, unmodulated carrier	< – 50 dBc < - 55 dBc typical 0 < f < 500 MHz, each component
Carrier phase noise:	Phase noise density (dBc/Hz) Frequency offset from carrier < –85 100 Hz < –85 1 kHz < –95 10 kHz < –110 100 kHz
Transmission modes:	Modulation on/off Carrier on/off

Table B.24: IF Out Monitor Specification

Item	Specification
Safety status:	SELV
Connector designation:	IF OUT MONITOR
Connector type:	BNC, female 75 Ω
Output impedance:	75 Ω
Output power:	–20 dB ± 2 dB referenced to the main IF output (IF OUT MAIN)
Return loss:	> 20 dB, 35 < f < 105 MHz
Main/monitor output isolation: (both directions)	>30 dB, 35 < f < 105 MHz

B.9.7 M2/EOM/ATM155... ATM Network Interface Module

Variants of The ATM Network Interface Module

The basic ATM Network Interface is part number S8062. To provide the interface to the B-ISDN telecoms network, a Physical Layer Module must be installed according to the type of network required. Refer to *Table B.25* for the types of B-ISDN networks which are supported.

Table B.25: B-ISDN Networks Supported

Physical Layer	Physical Layer Module	Physical Layer Bandwidth	Marketing Code
SDH STM-1 / SONET STS-3c Multimode Optical	S.8063	155.520 Mbit/s	M2/EOM/ATM155_MM
SDH STM-1 / SONET STS-3c Monomode Optical	S.8067	155.520 Mbit/s	M2/EOM/ATM155_SM

DVB-ASI Copper Output

Table B.26: DVB Copper Output Connection

Item	Specification
Safety status	SELV
Connector designation	DVB ASI
Connector impedance	75 Ω
Packet size	188 / 204 bytes
Data coding	8B 10B
Data rate	0.5 Mbit/s to 60 Mbit/s
Channel rate	270 Mbit/s

DVB-ASI Copper Input

Table B.27: DVB Copper Input Connection

Item	Specification
Safety status	SELV
Connector designation	DVB ASI
Connector Impedance	75 Ω
Packet size	188 / 204 bytes
Data coding	8B 10B
Data rate	0.5 Mbit/s to 60 Mbit/s
Channel rate	270 Mbit/s

10BaseT Ethernet Connector

Table B.28: Ethernet Connector

Item	Specification
Safety status	SELV
Connector designation	Ethernet
Channel rate	10 Mbit/s
Data coding	Manchester Coding
Specification	Complies with IEEE Standard 802.3i 1990 for Twisted Pair Ethernet
Max cable length	Typically 100 metres (CAT-5 UP)

Multimode Fibre Optic Connector

WARNING...
LED: CLASS I LASER PRODUCT.

NOTE...
The Class 1 LED warning is as defined in paragraph 5.2 of EN 60825-1 1994.

Table B.29: Multimode Fibre Optic Connector

Item	Specification
Connector type	SC type
Connector designation	SDH STM-1/OCR (MULTIMODE)
Data rate	155.520 Mbit/s
Centre wavelength	1270 nm (min) 1310 nm (typ) 1380 nm (max)
Emitter type	LED, InGaAsP
Emitter output power	-20 dBm (min) -14 dBm (max)
Detector type	PIN diode
Detector input power	-31 dBm (min) –14 dBm (max)
Optic fibre type	62.5/125 µm
Typical max fibre length	2000 metres

Monomode Fibre Optic Connector

WARNING...
LASER: CLASS I LASER PRODUCT.

NOTE...
The Class 1 Laser warning is as defined in paragraph 5.2 of EN 60825-1 1994.

Table B.30: Monomode Fibre Optic Connector

Item	Specification
Connector type	SC type
Connector designation	SDH STM-1/OC3 (MONOMODE)
Data rate	155.520 Mbit/s
Centre wavelength	1261 nm (min) 1360 nm (max)
Emitter type	LASER, InGaAsP
Emitter output power	-15 dBm (min) -8 dBm (max)
Detector type	PIN diode
Detector input power	-28 dBm (min) –7 dBm (max)
Optic fibre type	62.5/125 µm
Typical max fibre length	20000 metres

B.9.8 M2/EOM/REMUX Internal Remux Option Module

Connectors

Table B.31: DVB ASI In 1, 2 and 3 Connector

Item	Specification
Safety status	SELV
Connector designation	DVB ASI IN 1, DVB ASI IN 2, DVB ASI IN 3
Connector type	BNC
Connector impedance	75 Ω[4]
Data coding	8B/10B
Channel rate	270 Mbit/s
Specification	DVB A010 rev 1 (Asynchronous Serial Interface)[5]

Table B.32: DVB ASI Out 1 Connector

Item	Specification
Safety status	SELV
Connector designation	DVB ASI OUT 1
Connector type	BNC
Connector impedance	75 Ω[6]
Data coding	8B/10B
Channel rate	270 Mbit/s
Specification	DVB A010 rev 1 (Asynchronous Serial Interface)[7]

LEDs

Table B.33: DVB ASI In 1, 2 and 3 - LED Indications

Item	Specification
Red LED	Input ASI lock
On	No lock on ASI (8B/10B coding)
Off	Input ASI lock OK
Green LED	Packet size
Off	Not locked to MPEG packets
Flash (1:3 mark:space)	188 byte packets
Flash (3:1 mark:space)	204 byte packets

[4] 75Ω terminator must be fitted when this interface is not in use.
[5] Byte mode and single packet burst mode only.
[6] 75Ω terminator must be fitted when this interface is not in use.
[7] Byte mode and single packet burst mode only

Table B.34: DVB ASI Out 1 - LED Indications

Item	Specification
Red LED	
On	Output disabled
Off	Output enabled
Green LED	
Off	Output not in use
Flash (1:3 mark:space)	188 byte packets output
Flash (3:1 mark:space)	204 byte packets output

B.9.9 SMPTE 310 / ASI Output Option Module

SMPTE 310 Output Connector

Table B.35: SMPTE 310 Connector

Item	Specification
Safety status	SELV
Connector designation	SMPTE 310 1, 2, 3
Connector type	BNC, Female
Connector impedance	75 Ω
Packet size	188 bytes (without RS coding), 204 bytes
Data coding	Biphase Mark
Data rate	Typically 19.392658 Mbit/s but will accommodate all currently available receiving equipment

ASI OUT Connector

WARNING...
LED: CLASS I LASER PRODUCT.

NOTE...
The Class 1 LED warning is as defined in paragraph 5.2 of EN 60825-1 1994.

Table B.36: ASI Out Connector

Item	Specification
Connector type	SC type
Connector designation	ASI Out 1, 2
Data Rate	270 Mbit/s
Centre Wavelength	1280 nm (min) 1300 nm (typ) 1380 nm (max)
Emitter type	LED, InGaAsP
Emitter output power	-20 dBm (min) -14 dBm (max)
Optic Fibre type	62.5/125 µm
Typical max fibre length	2000 metres

Annex C

Predefined User Configurations

Contents

List of Tables

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C.1 Introduction

There are sixteen predefined user configurations. These are a quick and easy way to configure the Encoder without having to enter individual parameters.

C.2 General Default Settings

The Encoder default parameters settings are as shown in *Table C.1*.

Table C.1: Default Configuration Settings

Module	Parameter	Value
System:	Service Information	On
	Encoder Number	1
	Network Name	Tandberg Television Network
	Service Name	Default Service
	Network ID	0xFFFF
	Service ID	0x0001
	Transport Stream ID	0x0001
	Setup Password	OFF
Mux:	On Air	ON
	Mode	ASI
	Clock	Local Oscillator
	Lock Local to Remote PCR	Off
	PCR Timing Interval	40 ms
	PCR PID	0x1FFE
	ASI Bit-rate	40 Mbit/s
Video Preprocessor:	Teletext PID	0x111
	Teletext	On
	Video Input	Enabled
	Output on Video Loss	Freeze Frame
	Closed Caption	On
	Pan Scan Flags	Enabled
	WSS	On
	VPS	On
	Logo	Off
	Audio DID Extractors	Auto
Video Encoder:	Control Mode	Auto
	Bit-rate	8 Mbit/s
	GOP Structure	IBBP
	GOP Length	12
	Encode	On
	PCR Source	Base Board 3ASI
	Field/Frame Picture	Frame
	Chroma Mode	4:2:0
	Frame Rate	25 Hz

Module	Parameter	Value
	3:2 Pulldown/Repeat Field	Off
	Vertical Resolution	Full (576)
	Encoding Mode	Standard
	Aspect Ratio	4:3
	Horizontal Res	704
	Auto Horizontal Res	On
	Copyright	Off
	Original	Off
	StatMux	Off
	ITS Lines	Disabled
	Video PID	0x134
Audio (MPEG-2):	Coding Standard	MPEG Layer 2
	Source	Analogue (On)
	Audio Gain	12 dB
	Delay	201 ms
	Silence Timeout	Disabled
	Emphasis	Off
	Language (L)	English
	Language (R)	English
Audio (Dolby Digital):	Bit-rate	192 kbit/s
	Bit-stream Mode	Complete Main
	Coding Mode	2/0 (Stereo)
	Copyright	On
	Original	On
	Dolby Surround Mode	Not Indicated
	Dialogue Normalisation	-27 dB
	Audio Production Information	Off
	Mixing Level	25 dB
	Room Type	Not Indicated
	Dynamic Range Compression	Film light
	Sampling Frequency	48 kHz
	Channel Bandwidth Low Pass Filter	On
	DC High Pass Filter	On
Audio Musicam (MPEG-2):	Bit-rate	384 kbit/s
	Coding Mode	Stereo
	Copyright	Off
	Original	Off
	Sampling Frequency	48 kHz
	Base Board 3ASI Channel A PID	0x100
	Base Board 3ASI Channel B PID	0x101

If the 525 line defaults are selected, then:

- Frame Rate is set to 29.97 Hz
- GOP Length is set to 15

If the 625 line defaults are selected, then:

- Frame Rate is set to 25 Hz
- GOP Length is set to 12

C.3 Configuration Items not Affected by the Factory Default

Factory default settings do not affect the following configuration items:

- Model Number Reference and other associated IP Address
- Network Mask
- Gateway IP Address
- SNMP Trap Server IP Address
- UTC Offset
- Password for Setup Password Mode
- Foreground OSD Display Colour
- Background OSD Display Colour
- Text Message To Display in the event of Video Loss
- RAS1 key 1
- RAS1 key 2 (EBU key if loaded)
- RAS1 key 3 (for future extensions)
- Error Mask settings for all errors
- Number of start-ups
- Total Length of time powered on
- Current Time/Date (for calculating how long a unit has been powered off)
- Maximum Temperature
- Time/Date of Maximum temperature
- SABus address
- SABus baud rate
- SABus protocol (RS232/RS485)
- SABus number of data bits, parity etc (if applicable)
- Video Rate Buffer Mode
- Format for serial (RS232) insertion of closed caption data
- Display Errors on Front panel setting (i.e. do or don't)
- Software Version (for updating default parameters during upgrades)
- Output on Video Loss Mode
- Modulator Bandwidth-Symbol Rate Conversion Factor
- Up-Converter Frequency
- Audio Gain Offset 1 (IRD channel 1)

- Audio Gain Offset 2 (IRD channel 2)
- Minimum Number of teletext packets to send
- External Sync Source (on/off)
- External Sync Source Impedance
- Active Modulator - if able to switch between different modulator formats (e.g. Satellite & OFDM)
- Active Format Descriptor (on/off)
- AFD Failure Mode
- External PSIP generation
- External PSIP Remux Source
- Display Contrast/Darkness
- Write Protect Configs Flag
- Reflex Group
- Reflex Number
- Reflex Config UDP Port
- Reflex Status UDP Port
- MEM Encoder Number
- Next Spring Day & Month for Daylight Savings Time
- Next Autumn Day & Month for Daylight Savings Time
- First line encoded when in NTSC(line 22/23)
- Closed caption format (NDS/Tandberg or ATSC)
- Analog Video Input termination
- IP Address slot 1 (for option module slots)
- IP Address slot 2
- IP Address slot 3
- IP Address slot 4
- Network Mask 1
- Network Mask 2
- Network Mask 3
- Network Mask 4

C.4 Predefined User Configurations

The predefined user configurations have essentially the same settings as *Table C.1* except for those differences shown in *Table C.2*:

Table C.2: Predefined User Configurations

Configuration Number	Service Name	Variable	Value
1	Auto 2 Mbit/s	Video Source	Serial Digital
		Video Profile/Level	MP@ML
		Video Control Mode	Auto
		Video Bit-rate	2 Mbit/s
		Horizontal Resolution	352
2	Auto 4 Mbit/s	Video Source	Serial Digital
		Video Profile/Level	MP@ML
		Video Control Mode	Auto
		Video Bit-rate	4 Mbit/s
		Horizontal Resolution	544
3	Auto 6 Mbit/s	Video Source	Serial Digital
		Video Profile/Level	MP@ML
		Video Control Mode	Auto
		Video Bit-rate	6 Mbit/s
		Horizontal Resolution	720
4	Auto 8 Mbit/s	Video Source	Serial Digital
		Video Profile/Level	MP@ML
		Video Control Mode	Auto
		Video Bit-rate	8 Mbit/s
		Horizontal Resolution	720
5	Auto 15 Mbit/s	Video Source	Serial Digital
		Video Profile/Level	MP@ML
		Video Control Mode	Auto
		Video Bit-rate	15 Mbit/s
		Horizontal Resolution	720
6	Low Delay 2 Mbit/s	Video Source	Serial Digital
		Video Profile/Level	MP@ML
		Video Control Mode	Low Delay
		Video Bit-rate	2 Mbit/s
		Horizontal Resolution	352
7	Low Delay 4 Mbit/s	Video Source	Serial Digital
		Video Profile/Level	MP@ML
		Video Control Mode	Low Delay
		Video Bit-rate	4 Mbit/s
		Horizontal Resolution	544
8	Low Delay 6 Mbit/s	Video Source	Serial Digital
		Video Profile/Level	MP@ML
		Video Control Mode	Low Delay
		Video Bit-rate	6 Mbit/s
		Horizontal Resolution	720

Configuration Number	Service Name	Variable	Value
9	Low Delay 8 Mbit/s	Video Source	Serial Digital
		Video Profile/Level	MP@ML
		Video Control Mode	Low Delay
		Video Bit-rate	8 Mbit/s
		Horizontal Resolution	720
10	Low Delay 15 Mbit/s	Video Source	Serial Digital
		Video Profile/Level	MP@ML
		Video Control Mode	Low Delay
		Video Bit-rate	15 Mbit/s
		Horizontal Resolution	720
11	Very Low Dly 2	Video Source	Serial Digital
		Video Profile/Level	MP@ML
		Video Control Mode	Very Low Delay
		Video Bit-rate	2 Mbit/s
		Horizontal Resolution	352
12	Very Low Dly 4	Video Source	Serial Digital
		Video Profile/Level	MP@ML
		Video Control Mode	Very Low Delay
		Video Bit-rate	4 Mbit/s
		Horizontal Resolution	544
13	Very Low Dly 6	Video Source	Serial Digital
		Video Profile/Level	MP@ML
		Video Control Mode	Very Low Delay
		Video Bit-rate	6 Mbit/s
		Horizontal Resolution	720
14	Very Low Dly 8	Video Source	Serial Digital
		Video Profile/Level	MP@ML
		Video Control Mode	Very Low Delay
		Video Bit-rate	8 Mbit/s
		Horizontal Resolution	720
15	Vry Low Dly 15	Video Source	Serial Digital
		Video Profile/Level	MP@ML
		Video Control Mode	Very Low Delay
		Horizontal Resolution	720
16	422P @ ML 25M bit/s	Video Source	Serial Digital
		Video Profile/Level	PP @ ML
		Video Control Mode	Auto
		Video Chroma Mode	4:2:2
		Video Bit-rate	25 Mbit/s
		Horizontal Resolution	720

C.5 Predefined User Configurations (QPSK Modulator Option Fitted)

The predefined user configurations have essentially the same settings as *Table C.1* except for those differences shown in *Table C.3*.

Table C.3: Predefined User Configurations (QPSK Modulator Option Fitted)

Configuration Number	FEC	Service Name	Variable	Value
1	¾	Auto 6 MHz	Video Source	Serial Digital
		Mux bit-rate (188) = 6.4798 Mbit/s	Video Profile/Level	MP@ML
		Mux bit-rate (204) = 7.0313 Mbit/s	Video Control Mode	Auto
			Video Bit-rate	5.044 Mbit/s
		Packet Length = 204 bytes	Horizontal Resolution	Auto (544)
2	¾	Auto 7.5 MHz	Video Source	Serial Digital
		Mux bit-rate (188) = 8.0988 Mbit/s	Video Profile/Level	MP@ML
		Mux bit-rate (204) = 8.7891 Mbit/s	Video Control Mode	Auto
			Video Bit-rate	6.630 Mbit/s
		Packet Length = 204 bytes	Horizontal Resolution	Auto (720)
3	¾	Auto 9 MHz	Video Source	Serial Digital
		Mux bit-rate (188) = 9.7179 Mbit/s	Video Profile/Level	MP@ML
		Mux bit-rate (204) = 10.5470 Mbit/s	Video Control Mode	Auto
			Video Bit-rate	8.215 Mbit/s
		Packet Length = 204 bytes	Horizontal Resolution	Auto (720)
4	¾	Auto 13.5 MHz	Video Source	Serial Digital
		Mux bit-rate (188) = 14.5795 Mbit/s	Video Profile/Level	MP@ML
		Mux bit-rate (204) = 15.8204 Mbit/s	Video Control Mode	Auto
			Video Bit-rate	12.972 Mbit/s
		Packet Length = 204 bytes	Horizontal Resolution	Auto (720)
5	¾	Auto 18 MHz	Video Source	Serial Digital
		Mux bit-rate (188) = 19.4395 Mbit/s	Video Profile/Level	MP@ML
		Mux bit-rate (204) = 21.0913 Mbit/s	Video Control Mode	Auto
			Video Bit-rate	15 Mbit/s
		Packet Length = 204 bytes	Horizontal Resolution	720
6	¾	Low Delay 6 MHz	Video Source	Serial Digital
		Mux bit-rate (188) = 6.4798 Mbit/s	Video Profile/Level	MP@ML
		Mux bit-rate (204) = 7.0313 Mbit/s	Video Control Mode	Low Delay
			Video Bit-rate	5.044 Mbit/s
		Packet Length = 204 bytes	Horizontal Resolution	Auto (544)
7	¾	Low Delay 7.5 MHz	Video Source	Serial Digital
		Mux bit-rate (188) = 8.0988 Mbit/s	Video Profile/Level	MP@ML
		Mux bit-rate (204) = 8.7891 Mbit/s	Video Control Mode	Low Delay
			Video Bit-rate	6.630 Mbit/s
		Packet Length = 204 bytes	Horizontal Resolution	Auto (720)
8	¾	Low Delay 9 MHz	Video Source	Serial Digital
		Mux bit-rate (188) = 9.7179 Mbit/s	Video Profile/Level	MP@ML
		Mux bit-rate (204) = 10.5470 Mbit/s	Video Control Mode	Low Delay
			Video Bit-rate	8.215 Mbit/s

Configuration Number	FEC	Service Name	Variable	Value
		Packet Length = 204 bytes	Horizontal Resolution	Auto (720)
9	¾	Low Delay 13.5 MHz	Video Source	Serial Digital
		Mux bit-rate (188) = 14.5795 Mbit/s	Video Profile/Level	MP@ML
		Mux bit-rate (204) = 15.8204 Mbit/s	Video Control Mode	Low Delay
			Video Bit-rate	12.972 Mbit/s
		Packet Length = 204 bytes	Horizontal Resolution	Auto (720)
10	¾	Low Delay 18 MHz	Video Source	Serial Digital
		Mux bit-rate (188) = 19.4395 Mbit/s	Video Profile/Level	MP@ML
		Mux bit-rate (204) = 21.0938 Mbit/s	Video Control Mode	Low Delay
			Video Bit-rate	15 Mbit/s
		Packet Length = 204 bytes	Horizontal Resolution	720
11	¾	Very Low Dly 6 MHz	Video Source	Serial Digital
		Mux bit-rate (188) = 6.4798 Mbit/s	Video Profile/Level	MP@ML
		Mux bit-rate (204) = 7.0313 Mbit/s	Video Control Mode	Very Low Delay
			Video Bit-rate	5.044 Mbit/s
		Packet Length = 204 bytes	Horizontal Resolution	Auto (544)
12	¾	Very Low Dly 7.5 MHz	Video Source	Serial Digital
		Mux bit-rate (188) = 8.0988 Mbit/s	Video Profile/Level	MP@ML
		Mux bit-rate (204) = 8.7891 Mbit/s	Video Control Mode	Very Low Delay
			Video Bit-rate	6.630 Mbit/s
		Packet Length = 204 bytes	Horizontal Resolution	Auto (720)
13	¾	Very Low Dly 9 MHz	Video Source	Serial Digital
		Mux bit-rate (188) = 9.7197 Mbit/s	Video Profile/Level	MP@ML
		Mux bit-rate (204) = 10.5470 Mbit/s	Video Control Mode	Very Low Delay
			Video Bit-rate	8.215 Mbit/s
		Packet Length = 204 bytes	Horizontal Resolution	Auto (720)
14	¾	ISOG 4:2:0	Video Source	Serial Digital
		Mux bit-rate (188) = 8.4480 Mbit/s	Video Profile/Level	MP@ML
		Mux bit-rate (204) = 9.1670 Mbit/s	Video Control Mode	Auto
			Video Bit-rate	7.534 Mbit/s
		Packet Length = 204 bytes	Horizontal Resolution	704
15	7/8	ISOG 4:2:2	Video Source	Serial Digital
		Mux bit-rate (188) = 21.5030 Mbit/s	Video Profile/Level	422P@ML
		Mux bit-rate (204) = 23.3330 Mbit/s	Video Control Mode	Auto
			Chroma Mode	422
			Horizontal Resolution	720
			Video Bitrate	19.748 Mbit/s
		Packet Length = 204 bytes	Symbol Rate	13.3332 Msym/s

Configuration Number	FEC	Service Name	Variable	Value
16	¾	422P@ML 18 MHz	Video Source	Serial Digital
		Mux bit-rate (188) = 19.4393 Mbit/s	Video Profile/Level	MP@ML
		Mux bit-rate (204) = 21.0938 Mbit/s	Video Control Mode	Auto
			Video Chroma Mode	4:2:2
			Video Bit-rate	17.728 Mbit/s
			Horizontal Resolution	Auto (720)
		Packet Length = 204 bytes	Symbol Rate	14.0625 Msym/s

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Annex D

Language Abbreviations

Languages are shown in alphabetical order.

LANGUAGE	ABBREVIATION
AFRIKAANS	AFR
ALBANIAN	ALB
ARABIC	ARA
BASQUE	BAQ
BRETON	BRE
BULGARIAN	BUL
CHINESE	CHI
CZECH	CZE
DANISH	DAN
DUTCH	DUT
ENGLISH	ENG
ESTONIAN	EST
FINNISH	FIN
FRENCH	FRE
GAELIC	GAE
GERMAN	GER
GREEK	GRE
HUNGARIAN	HUN
ICELANDIC	ICE
INDONESIAN	IND
IRISH	IRI
ITALIAN	ITA
JAPANESE	JPN
KOREAN	KOR
LATVIAN	LAV
LITHUANIAN	LIT
MACEDONIAN	MAC
MALAY	MSA
MISCELLANEOUS	MIS
MULTIPLE LANGUAGES	MUL
NDEBELE	NDE
NORWEGIAN	NOR
POLISH	POL
PORTUGESE	POR
ROMANIAN	RUM
RUSSIAN	RUS
SERBO-CROAT	SCR
SLOVAK	SLK
SOMALI	SOM
SPANISH	SPA
SWAHILI	SWA
SWEDISH	SWE
THAI	THA
TIBETAN	TIB
UNDEFINED	UND
UKRANIAN	UKR
WELSH	CYM

The following non-ISO[1] languages are supported.

NOTE...

Only applicable for a transport stream going to an Alteia Receiver.

REFERENCE	ABBREVIATION
MAIN	ONE
AUX	TWO
INTERNATIONAL SOUND	INT
AUDIO 1	AAA
AUDIO 2	AAB
AUDIO 3	AAC
AUDIO 4	AAD
AUDIO 5	AAE
AUDIO 6	AAF
AUDIO 7	AAG
AUDIO 8	AAH
AUDIO 9	AAI
AUDIO 10	AAJ
AUDIO 11	AAK
AUDIO 12	AAL
AUDIO 13	AAM
AUDIO 14	AAN
AUDIO 15	AAO
AUDIO 16	AAP

The non-ISO “languages” allow tagging of audio without reference to specific languages. The system can then transmit two languages (as Main and Auxiliary) which could be any type of audio.

NOTE...

The non-ISO languages need to be user defined in the MCC or Encoder for them to be available

[1] International Standards Organisation.

Annex E

Creating and Downloading a Logo

Contents

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E.1 Introduction

There is a logo overlay facility allowing broadcasters to trademark material whereby the Encoder is able to overlay broadcasters trademarks/logos onto the active video. This is available for the E5210, E5410 and E5610[/48] Encoders.

To overlay or brand the material with a logo, the logo must first be downloaded into the equipment using the Ethernet TFTP protocol. Once this has been done the logo can be enabled or disabled.

E.2 Creating a Logo Using OSD Creator

Osd Creator is an application for creating .osd format files for use with the *Osd Loader*. It accepts Windows .bmp format files as input. It includes the facility to introduce a **mix** component into the image, so that when the image is superimposed onto video, some areas appear to be transparent. The mix can be added manually, or by loading a separate **key file**.

The application also includes the facility to downsample the image to the desired size.

The application runs under Windows 95 or Windows NT.

E.3 Using OSD Creator

E.3.1 Procedure

To create an .osd file:

1. Load a .bmp file.
2. Create transparency in the desired areas.
3. Downsample to the desired size.
4. Save as an .osd file.

E.3.2 Loading a .bmp File

Select **File/Open** from the menu, and choose a file with a .bmp extension. The image is displayed in its own window. The application does not accept compressed bitmaps or multi-planed bitmaps.

E.3.3 Creating Transparency

Overview

The area of the image that is to be made transparent is called the inactive area. The rest is the active area.

Transparency can added manually, or by using a **key file**. A **key file** is a .bmp file of the same size as the source file, with the active area of the image coloured white, the inactive area coloured black, and intermediate levels of transparency coloured grey.

Adding Transparency Manually

Firstly, change the background colour so that it contrasts sharply with the whole of the source image, using the black, red, green or blue buttons on the toolbar. This makes it easier to spot mistakes.

The left button is used to make an area transparent (mix 0), the right button makes it opaque (mix 255). Different mix levels can be entered for intermediate levels of transparency. The brush size determines the size of the area that is changed.

If the **Changes Affect Palette** box is checked, changing the transparency of a pixel on the image also changes the palette entry on which the pixel is based, and all the pixels that share that palette entry.

If the inactive area is mainly one colour, check the **Changes Affect Palette** box, and left-click in the inactive area. All pixels of that colour should become background-coloured. Repeat until the whole of the inactive area is transparent. If parts of the active area have become transparent, uncheck the **Changes Affect Palette** box, and paint with the right button to correct these areas. Zoom in if necessary.

If there is no general colour for the inactive area, uncheck the **Changes Affect Palette** box and paint the inactive area manually with the left mouse button. Use the right button to correct mistakes. Trace around the edge of the area with a medium brush, then use the large brush for wide areas. Zoom in to do the fine corrections.

Adding Transparency Using a Key File

Create the **key file** using a drawing package. Colour the active area white, and the inactive area black. Save as a .bmp file.

Click the **Key File** toolbar button. Select the **key file**. The inactive area of the image should now be transparent (background-coloured). Change the background colour to verify that the correct area is transparent.

Editing the Palette

The palette may be displayed alongside the image by clicking the **Show/Hide Palette** toolbar button. The transparency of each palette entry may be altered in the same way as the image itself, using the left and right mouse buttons. Changes to the palette are shown immediately on the image.

The Red, Green, Blue and Mix component of the pixel or palette entry under the cursor can be seen on the status bar at the bottom of the screen.

Palette Reallocation

When the level of transparency of a pixel in the image is changed, a new colour is effectively created. Whenever the image is downsampled or saved, the palette is rebuilt to reflect the actual colours in the image. As part of this process, pixels which have a mix value of zero are mapped to palette entry zero, which is defined as Red = Green = Blue = Mix = 0. The original colour information is lost and the right mouse button will not change the pixel back to its original colour.

To rebuild the palette during editing, click the **Reallocate Palette** toolbar button.

E.3.4 Downsampling

Click the **Downsample** toolbar button. A dialog box appears asking for a downsampling ratio. This can be specified directly, or by entering the desired image size. Click OK to downsample the image. The downsampling algorithm includes a filter, so the boundary between the active and inactive areas softens slightly. Zoom in and check that the correct areas are transparent, and make corrections if necessary.

E.3.5 Saving the .osd File

Select **File/Save As/OSD file** from the menu. Saving is possible at any time, and it is advisable to save the image often while editing is in progress. The file may also be saved in .bmp format, but this file will not contain transparency information.

E.4 Downloading a Logo Using OSD Loader

The *Osd Loader* is an application for transferring On Screen Display files to the Encoder, and causing the images in these files to be overlaid on the input to the Encoder. This enables logos to be superimposed on the encoded bit-stream without an additional preprocessor.

The application runs under Windows 95 or Windows NT on an ordinary PC. A network connection is required. The target Encoder's IP address must be **visible** from the host PC.

The application uses the .osd file format for images. These can be derived from Windows .bmp files using the ***OSD Creator*** application (see *E.2, Creating a Logo Using OSD Creator*).

E.5 Using the OSD Loader

E.5.1 Start-up

Activate the application. The application attempt to connect to the last known Encoder address. If the address is not correct, click the **Abort Transfer** button and enter the IP address of the target Encoder. This can be found on the Encoder front panel by selecting **Menu/Status/System/General**. To test the connection, click the **Remove All** button (you will be prompted for confirmation). The communications box (at the top of the screen) should read “Transfer Completed OK”. Select **625 Lines** or **525 Lines** depending on the current line standard.

E.5.2 Download an .osd File

Choose an On-screen Display file with the **Choose File** button. You will be prompted for a file with an .osd extension. The image will be displayed in the **OSD File** box.

Position the image on the screen by dragging the white cursor box around the main window. The position can also be adjusted by editing the co-ordinates boxes. When the cursor is positioned, click the **Download** button. The image will be displayed in the main window. Wait for "Transfer Completed OK" to appear in the communications box. After a short delay, the image should appear on the output from the receiver.

E.5.3 Show and Hide Regions

The **Download** button defines a Region in the Encoder, which remains until the Encoder is turned off, the **Remove** button is clicked, or the Region is **Download**ed again. The Region may be in the Shown or Hidden state, which determines whether it appears in the video stream. If the **Auto Show** box is checked, the initial state is Shown. Use the **Show, Hide, Fade Up** and **Fade Down** buttons to change the state of the region. Shown regions have a green border in the main window, Hidden regions have a red border.

E.5.4 Multiple Regions

Multiple Regions may be displayed. To define an additional Region, change the Region Number at the top of the **Region Operations** box, and repeat the **Download** procedure. Buttons in the **Region Operations** box only affect the current Region number (with the exception of **Remove All**). The current Region can also be changed by double-clicking on the image in the main window. The current region has a brighter border in the main window. Select **View As Numbers** to display the Region number in the main window instead of the image.

E.5.5 Region Interference

If two Regions share a horizontal line, they may interfere. This means that when both Regions are Shown, only one actually appears in the video stream. The application warns if this is the case. When one of the Regions is Hidden, the other may be Shown as normal.

E.6 Fault-finding

If there appears to be a problem creating or downloading a logo, check the following:

- If the Communications box reads "Error Creating Socket", there may be a problem with the PC's network set-up, or another application may be using the TFTP socket number.
- If the Communications box reads "Waiting For Response" for a long time, the target Encoder is either busy or not visible on the network. Abort the transfer before changing the IP address.
- Large images take time to appear due to network transfer rates and image processing.
- If the download completes, but the OSD image does not appear on video, the image may be too near the edge of the screen – try moving it towards the centre. Make sure the correct line standard is selected.
- Make sure the image is visible on a typical domestic television. Make a note of the co-ordinates where the image is required.

- If precise timing is required, **Download** the image in advance with **Auto Show** off, then click **Show** when display is required.
- To move the current Region, reposition the white cursor, check that the **OSD File** box has the correct image, and click **Download**.

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Annex F

Accuracy of Frequency Sources

This equipment is based around ISO/IEC 13818 specifications (commonly known as MPEG-2) and within these specifications all timing is derived from a 27 MHz system clock. The system clock is required to have an accuracy better than ±30 ppm. This equipment has an oven-controlled crystal oscillator (OCXO) that achieves this accuracy within five minutes of applying power, over the specified operating temperature range and for the life of the product, without further adjustment.

Composite television systems such as PAL and NTSC have traditionally used high precision oscillators for colour sub-carrier. Many different specifications are in common use and required accuracies in the range ±0.2 ppm to ±2 ppm are common. Typically an entire TV studio runs from a central frequency standard, with all equipment being fed with a 'black and burst' reference signal.

Generally, individual items of equipment are not capable of the required accuracy in the absence of this reference. Where a suitable reference is not available (e.g. outside broadcast or intercontinental programme exchange) the specifications allow a relaxed accuracy.

When this equipment is used to source a timing reference that is used to generate a composite video output (for instance the PAL or NTSC output of a TANDBERG Television Receiver/Decoder) the accuracy of the resultant sub-carrier is directly traceable to this equipment's 27 MHz system clock.

Where an accurate reference signal is not available this equipment's OCXO must be used. The OCXO is adjusted to better than ±0.2 ppm during manufacture, but natural ageing of the OCXO means that regular calibration is required if composite video accuracy is needed. Calibration intervals depend on the requirements of the particular composite video specification in force. Please contact TANDBERG Television Customer Services for advice.

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Annex G

How to Use Scrambling

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G.1 Scope of This Annex

This guide explains the different scrambling schemes supported by stand-alone Encoders E5x11 and small groups of Encoders multiplexed into a single stream using internal Multiplexers M2/EOMx/MUX. It does not cover systems operation with an external Multiplexer.

G.2 Available Scrambling Schemes

Depending on the model, software version and options fitted in the Encoder, RAS, BISS, and BISS-E are available. To find out if scrambling is available in an Encoder see *Section 3.1.2, How to Find What Modules are Fitted*.

G.3 Which Scrambling Scheme to Use

G.3.1 Overview

The three schemes offered in TANDBERG Television products offer different security advantages, the choice depends on the level of security needed, how you want to distribute session keys and any requirement for interoperability with third-party equipment.

G.3.2 Remote Authorisation System (RAS)

- Uses proprietary scrambling hardware so is not interoperable with third-party equipment
- RAS scrambling algorithm is moderately secure, since it uses proprietary hardware there are only limited numbers of RAS capable decoders that might be used to intercept the broadcast without authorisation, so the overall level of security is good
- Key limited to 32-bits so an export licence not normally required

G.3.3 Basic Interoperable Scrambling System (BISS)

- Uses industry-standard DVB Common Algorithm scrambling so is interoperable with third-party equipment supporting BISS conforming to Tech 3290 March 2000 (BISS) and to Tech 3292 April 2001 (BISS-E).
- Common algorithm scrambling is very secure so without the session key an unauthorised person is very unlikely to be able to receive the broadcast
- The same session key is entered into encoders and decoders so there is a security risk if an operator shares a key with other non-authorised BISS users – but key distribution is very simple
- Key limited to 48 bits so an expert licence not normally required
- BISS specification defines four modes, 0 to 3. TANDBERG Television products support modes 0 and 1.

G.3.4 Extended BISS (BISS-E)

- Uses the same industry-standard DVB Common Algorithm scrambling as BISS so is interoperable with third-party equipment conforming to BISS (EBU Tech 3290 March 2000) and BISS-E (EBU Tech 3292 April 2001)
- Common algorithm scrambling is very secure so without the session key an unauthorised person is very unlikely to be able to receive the broadcast – the same level of security as for BISS
- Each item of equipment uses an individual key so key distribution is more complex. For a small point-to-point system this is manageable but for a large network e.g. with multiple Decoders key management becomes a significant task
- Keys are generated using PC software and the unique ID for the Encoders and Decoders.
- Keys cannot be shared between operators so there is improved security at the Encoder and Decoder sites
- BISS-E hides the session key from the operator so you cannot mix BISS and BISS-E in a broadcast chain
- Key limited to 48-bits so expert licence not normally required

G.3.5 Differences Between BISS Modes 0 to 3

- Mode 0 is no scrambling.
- Mode 1 uses a key that stays the same for the whole of a broadcast (fixed key).
- Modes 2 and 3 use keys that change during the period of a broadcast (variable key).

G.3.6 Support of BISS Modes 2 and 3

TANDBERG Television does not support modes 2 and 3 because these modes add complexity with little improvement in security. The weakest aspect of BISS is open key distribution and this is addressed by BISS-E.

G.4 Scrambling Keys

G.4.1 Choosing and Distributing Keys

RAS and BISS

For RAS and BISS, just make it up and enter it into the Encoder(s) and Decoder(s) (see *Section G.4.2*).

BISS-E

For BISS-E, you'll need the unique ID of each Encoder and Decoder in the broadcast chain. You'll also need a PC with TANDBERG Television's BISS-E application. (Since BISS is interoperable, you can also use third-party software to generate keys.)

G.4.2 Entering a Key into an Encoder

How to Enter a Key and Activate It

Entering the Key is through the Mux Menu (see *Figure 4.15*). Also, remember to turn on the scrambling.

BISS-E Keys

BISS-E requires the correct key for each item of equipment. The unique ID is displayed, so distribute each key with the unique ID used to generate it, you can read it back and verify that the unique ID is correct before the key is entered.

G.5 How to Check that the Scrambling is Working

Check for correct scrambling by using a Decoder without scrambling capability to try to decode the scrambled stream. You can also use a transport stream monitor, such as TT4010, to check for correct operation.

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Annex H

Quick Reference Guide

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H.1 Introduction

This annex provides advice for new users on configuring the Encoder after power-up. Power-up (and power-down) instructions are provided in *Chapter 2*, *Installing the Equipment*.

> NOTE...
> The output is automatically turned on at power-up.

H.2 Choosing Parameters

Refer to *Chapter 2*, *Installing the Equipment* for information on how to use the front panel softkeys and keypad in order to move through the menu and option screens.

> NOTE...
> The menu options available depend on the option modules fitted.

Step 1: **Check configuration**

Check the `Status Menu` screens to confirm whether the currently set parameters for each functional area (System, Video, Audio, Data, Modulator and Mux) meet with requirements. If they do, then the equipment is ready for operation. The equipment begins generating a valid transport stream.

If parameters need to be changed, proceed to the next step.

Step 2: **Change configuration**

If the required parameters are saved as a configuration file then load the relevant file.

If the required parameters are not saved as a configuration file:

Set all audio parameters. Enable audio channels, set the coding mode and standard, bit-rate and all other parameters as required.

Set all data parameters. Enable the data channels and set the baud-rate/bit-rate as required.

Set the required multiplex rate.

Check video bit-rate and resolution. These parameters have been set automatically according to the selections made above. Check that the values set are correct for the required application. If not, manual adjustments can be made to reduce the audio and data requirements, freeing up more bandwidth to allow higher resolution video to be processed.

H.3 Automatic Data Rate Selection

The Encoder is normally allowed to automatically select the video bit-rate and resolution. The starting point is usually to enter the output bit-rate. The Encoder automatically selects an appropriate output video bit-rate to fill the multiplex. This automated process takes into account the data-rates which have been manually allocated to audio and data services. From the permissible bit-rate, the pixel resolution is selected automatically to maximise the quality of the video channel.

Indexes

This section is split into two parts. The first is the **General Index** and the second is devoted to **Setup Menus and Associated Options**.

The following conventions are used in this manual: a page number entry in **bold** indicates a reference to a heading; a page number entry in *italic* is a reference to a table or figure; otherwise the page number indicates a reference to an entry on that page.

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